Workers beneath the Floodgates: The Impact of Low-Wage Import Competition and Workers' Adjustment

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November, 2015

I analyze the impact of a low-wage trade shock on manufacturing workers in a high-wage country, Denmark, and how they adjust to the shock over a decade across *all* potential adjustment margins, in the labor market and outside. My research illustrates the importance of industry-specific human capital in trade adjustment and provides initial evidence of skill upgrading at the individual level as workers re-build lost human capital through education. Employing administrative person-level panel data matched with employer data for the period 1999 to 2010, I exploit the dismantling of import quotas on Chinese textile and clothing products in conjunction with China's accession to the WTO as a quasi-natural experiment and utilize within-industry heterogeneity in workers' exposure to this trade shock. Results show a negative and significant impact of the low-wage import shock on workers' future earnings and employment trajectories, which stems mainly from shortened employment at the firm that was exposed to the competition shock and subsequent difficulty in maintaining stable employment. While the service sector is the main absorber of all types of workers displaced by the import shock, recovery from the shock in service sector jobs varies greatly across workers depending on occupation, education and age. Less-educated, older and workers who had occupations with a high industry-specific skill content at the exposed firms had the worst adjustment experience. The results show that trade-induced adjustment costs are substantial and heterogeneous across workers. For some, challenges remain even after transitioning to full-time jobs outside of manufacturing, as the loss of human capital specific to their former industry remains as an important hurdle to recovery.

JEL Classification: F16; F66; J60; J24; J31; L67

*Email: haleutar@gmail.com. The study is sponsored by the Labor Market Dynamics and Growth Center (LMDG) at the University of Aarhus. Support of the Dept. of Economics and Business, Aarhus University and Statistics Denmark are acknowledged with appreciation. The author thanks Henning Bunzel for facilitating the access to the confidential database of Statistics Denmark and for his support, Wolfgang Keller and Casper Thorning for comments and suggestions. The study also benefited from the participants of seminars at U of Groningen, IfW Kiel, Bielefeld U, U of Duisburg-Essen, U of Nottingham, and Applied International Trade Workshop at Bilkent U, DFG 1764 conference on The German Labor Market in a Globalized World, Barcelona GSE Summer Forum 2015, LETC 2015, CAED 2015, and the ES World Congress 2015.

1 Introduction

The rapid rise of China in the world economy has been a major driver in a general dramatic increase in trade between developing and advanced countries since the beginning of the last decade. From 1999 to 2011 China's share in external imports of the EU grew from 7 % to 17 %, and in 2005 China replaced the US as the most important import supplier to the EU.[1] This development coincides with a decline in manufacturing employment in advanced economies and an increasing importance of the service sector. As the waning of stable manufacturing jobs is causing considerable anxiety in advanced countries, many observers today ask what the consequences of raising trade with China are and how workers and society can best adjust.

Recent research has made great progress in understanding the consequences of the raising trade with low-wage countries on firms and industries and documented significant labor reallocation as a result (e.g. Bernard, Jensen, Schott (2006), Khandelwal (2010), Autor, Dorn, Hanson (2013), Utar and Torres-Ruiz (2013), Utar (2014), Pierce and Schott (2014), Bloom, Draca, Van Reenen (2015)). This opens the question of what happens to the workers when they are displaced from their workplaces due to import competition from low-wage countries.[2] If workers can efficiently switch to another job within the same industry, the earnings consequences (and broader welfare consequences) are small. But what are the options available to manufacturing workers when facing low-wage import competition and what are their adjustment costs in reality? Are the possible paths of adjustment different for workers depending on their individual investments in human capital - reflected in their education, occupation and age - and how do these differences affect the cost of adjustment? And to what degree can social and labor market policies facilitate workers' adjustment and cushion the impact of the import shock? The answer to these questions not only inform public debate but also helps policy makers pursue pro-globalization policies that are sustainable in the long run.[3]

[1] Author's calculation based on EuroStat trade database. The EU is consistently defined over the period as EU-25.

[2] It has been shown that involuntary job displacement due to plant downsizing can have lasting negative effect on workers' earnings for years after the event and can even have non-pecuniary negative effects such as reduced life expectancy. Jacobson, LaLonde and Sullivan (1993) finds that workers involuntarily displaced by plant downsizing in Pennsylvania during the recession of the early 1980s suffered annual average earnings losses of 25 percent, even six years following displacement. Sullivan and von Watcher (2009) finds that the short-term mortality rates of involuntarily displaced workers approximately doubled and their life expectancy was reduced by one to one and a half years on average.

[3] Recently it has been argued that Europeans are doing better at easing the burden on the most exposed

Recently Autor, Dorn, Hanson and Song (2014) documented that American workers under direct threat from low-wage import competition have lower cumulative earnings and higher risks of exiting the labor force. The costs of adjustment, they find, is disproportionately borne by low-wage workers, who stay within manufacturing, while high-wage workers, who have higher likelihood of moving out of manufacturing, adjust successfully.[4] Their results imply that a necessary condition for a successful adjustment is being able to move out of manufacturing.[5] But their results do not answer whether the costs of adjustments are limited to the frictions that slow down or prevent workers being able to move to new sectors and whether moving out of manufacturing, in itself, is a sufficient condition for a smooth recovery. Their results further raise the question of why the transition out of manufacturing is easier for high-wage workers than for low-wage workers and what underlying characteristics of these two categories drive the difference. A deeper understanding of the nature of the adjustment costs and frictions that manufacturing workers experience when moving to a new sector is necessary to address these questions and develop policies to minimize the costs from globalization shocks.

In this paper I analyze the effects of Chinese competition on a rich set of workers' outcomes and study workers' adjustment experience in a European country with a generous social net and active labor market policies (ALMP). By exploiting the exogenous expiration of the import quotas for China in conjunction with its WTO accession as a quasi-natural experiment, I show that workers' adjustment costs are substantial even after moving out of manufacturing to the service sector. In the context of advanced countries' transition from industrial to service economies, my results imply that policies that can increase workers' mobility toward growing sectors may not ensure lower adjustment costs for workers, as the loss of industry and occupation specific human capital emerges as an important hurdle to recovery in the new environment.

I utilize the exogenous expiration of the Multi-fiber Arrangement (MFA) quotas for China in conjunction with its accession to the WTO to identify workers who were employed in Danish firms that were hit by cheaper imports from China, and analyze the impact of a Chinese import shock on workers' future earnings, income, employment and unemployment

to Chinese competition in comparison to the US. (NYTimes, Feb 2, 2012, Chrystia Freeland)

[4]For analyses of workers' adjustment to trade liberalization in developing countries see also Menezes-Filho and Muendler (2011) and Dix-Carneiro and Kovak (2015)'s analyses on Brazil.

[5]They show that high-wage workers were able to move out of manufacturing while low-wage workers stay within manufacturing where they are repeatedly exposed to the shock, and hence experience costly adjustment.

trajectories. As the textile and clothing industry is a classic labor-intensive manufacturing industry, utilizing the expiration of the MFA quotas not only provides a clear experiment, but also a very suitable lens through which to study the effect of the import shock from China on manufacturing workers(Bloom, Draca, and Van Reenen (2015), Utar (2014)).[6]

Using longitudinal administrative data from Statistics Denmark, I follow manufacturing workers in 1999 over the decade following the WTO accession of China and study workers' adjustment to the globalization shock both within the labor market as workers move between jobs, industries and broad sectors but also across labor market positions as they re-consider whether and in which role to participate in the labor market. Using domestic production data at the detailed product and firm level, I first identify firms that domestically manufacture products that were subject to import quotas for China. Then, using matched employer-employee level data, I identify workers who were employed in affected firms before the WTO accession of China. I then measure differential labor market trajectories of these affected workers relative to other workers initially employed in the same industry over the years 2002-2010 after controlling for detailed worker and workplace characteristics and industry-wide aggregate shocks.

Technological forces are among important factors that cause decline in manufacturing employment in advanced countries (Machin and Van Reenen (1998)). Especially, labor-intensive industries such as the textile and clothing industry have been shrinking since the 1960s due to factors that include both low-wage competition and technological changes. Hence it is vital to be able to distinguish the impact of the trade shock from other factors. The empirical strategy in this paper directly utilizes the change in trade policy and within-industry heterogeneity in exposure to the resulting import competition. By using a comparison group of workers employed, ex-ante, in the same industry with very similar characteristics and facing the same technological and demand shocks, this study is able to disentangle the impact of the trade shock on workers' outcomes from potentially important other forces, such as technological progress, and thus to derive causal implications.

I show that increased competition with China leads to significant reductions in affected workers' earnings over the period 2002-2010. The earnings losses amount on average to 70 % of an initial annual wage after nine years of the post-WTO period. Workers exposed

[6]Bloom, Draca, Van Reenen (2015) utilizes the removal of MFA quotas for China associated with its WTO membership as an import shock from China at the four digit industry-level. This study differs from Bloom, Draca, Van Reenen (2015) by utilizing the quota removal at the firm/worker-level.

to the competition have higher likelihood of unemployment and shorter future employment spells. The trade shock affects them mainly via shorter employment at the initial firm and subsequent job instability experienced especially in the service sector. This paper shows that significant reductions in annual earnings mostly operated on the quantity margin (number of hours worked instead of hourly rates). These results are consistent with the general structure of the Danish labor market which is characterized by liberal hiring-firing regulations (as in the US) with a high degree of unionization.[7]

Examining the differential impact of low-wage competition according to worker and firm characteristics, I find that workers are more or less homogeneously affected by the import shock via their employment at a firm exposed to the competition. Whether a secretary, machine operator, or manager at the exposed firm, and whether college educated or not, the trade shock affects workers similarly at the exposed firm. Their employment there is shortened by about one year. Regardless of education, occupation or age, the growing service sector provides the most viable path to new employment and, although to varying degrees, the trade shock significantly increases the likelihood of moving to the service sector for all types of workers.

However, adjustment after making this move is very heterogeneous depending on worker characteristics. College educated workers have an easier time keeping stable employment in the service sector, which allows them to compensate relatively quickly for the earnings loss incurred at the exposed employer. Workers with vocational and lower levels of education, on the other hand, do not recover well from the shock, even when they find full-time positions in the service sector. Success of recovery in the service sector of lost earnings potential is, in general, inversely related to age. Mid-aged displaced workers tend to stay within the manufacturing sector relative to older and younger cohorts and younger cohorts fare better in service sector jobs. But most importantly, the results show that there is a substantial difference in the workers' success in recovery depending on the occupation they held at the initial employer. The impact of the import shock at the exposed firms was felt the same for both a typical secretary and a machine operator, amounting to 115 % of their initial wage, but a machine operator suffered earnings losses equivalent to one year's earnings over the following decade while a secretary fully recovered the loss with no significant impact over the decade. Professionals and office and clerical workers are largely observed to switch to

[7]The Global Competitiveness Report 2013-2014 ranks Denmark 6th among 148 countries at hiring and firing practices, indicating very de-regulated hiring and firing practices (US is ranked 9th in the same ranking), while it is ranked 93rd for flexibility of wage determination.

stable and gainful jobs in the service sector, while e.g. machine operators and manufacturing labourers suffer frequent unemployment after making the sector switch. Seen together the observations on workers' adjustment across education, age and occupation show a picture in which their ability to recover from the shock depends on 1) how much of their human capital is tied up in their occupational experience and 2) to what degree this human capital is either relevant to work in the service sector or is lost because of the trade shock. Especially vocationally trained workers and workers with occupations that require strong industry specific skill face a difficult situation in the aftermath of the shock. These results highlight the nature of difficulties that advanced countries face on the path of employment de-industrialization and provide a new light to the distributional consequences of trade with low-wage countries.

Since the right skill set and the ability to adapt to the new environment are found to be important determinants of recovery from the trade shock, import competition could potentially lead to investment in human capital through education.[8] This relates to the important question of whether trade with low-wage countries alters the demand for skill in advanced countries and in their offshore locations. Recent studies show supporting evidence for skill upgrading at the firm and establishment level (Bloom, Draca, van Reenen, Utar (2014), Utar and Torres-Ruiz(2013)). I find that the trade shock causes workers to seek further education and that this effect is strongest among the least educated and those facing the most difficult adjustment. Thus this paper shows the first direct evidence that trade with low-wage countries can lead to skill upgrading at the individual level and thereby potentially increase the supply of skill.[9] By showing that trade can induce potential adjustment also in the *supply* of skill, this paper points to a factor that mitigates the effect of trade causing wage disparity.[10]

The results presented in this paper augment and deepen the observations on the adjustment

[8]Nelson and Phelps (1966) emphasize the role of education in the ability to adjust to changing conditions. Bartel and Sicherman (1998) show that changing technological conditions may induce investment in human capital.

[9]Looking at a potential effect of trade on the supply of skill from a different angle, in a recent study Atkin (2015) shows that export expansion triggered by the trade reforms in Mexico causes school dropouts.

[10]A link between trade and skill is mostly drawn in a Heckscher-Ohlin framework via trade's effect on returns to skill (the Stolper-Samuelson effect). Earlier literature investigating the question of whether trade with lower wage countries was an important factor in driving the increase in income inequality observed in many advanced countries in the 1980s and 1990s did not find strong empirical support in comparison to alternative explanations such as technology factors. In the US, for example, the share of income received by the lowest quintile of households fell from 4.4 % in 1977 to 3.6 % in 1997, while the share of income received by the highest quintile of households has risen from 43.6 to 49.4 % over the same period (Feenstra (2000)).

of American workers to a Chinese trade shock provided by Autor, Dorn, Hanson, and Song (2014). It shows that among advanced countries the significant negative effect on workers' labor earnings is not particular to the US economy. It also provides insight into the role that institutional differences between the US and a Nordic social system can play in how the shock is felt. The trade shock is not found to lead to labor market exit among Danish workers altogether and their earnings losses were largely compensated in the form of unemployment insurance. Danish workers were relatively mobile between jobs and sectors, and jobs in the service sector proved to be important for recovering from the initial loss of earnings and employment in Denmark also. As opposed to the American experience, what is found to be critical in Danish workers' adjustment process was not inability to move to service sector jobs but rather inability to keep stable employment there. As all unemployed people are subject to the active labor market policies in Denmark, ALMP is one likely reason behind the mobility of Danish workers. But these results also show that being able to move to the service sector, which is relatively protected from trade shocks, is not enough to secure smooth recovery, especially for workers who would need to make a substantial change in their human capital to function in the new environment.

This paper also contributes to the empirical literature on labor reallocation in response to trade shocks which mostly focus on economy-wide trade liberalization episodes.[11] The MFA quotas, while economically important and substantial (Harrigan and Barrows (2009), Khandelwal, Schott and Wei (2013), Bloom, Draca, Van Reenen (2015), Brambilla, Khandelwal and Schott (2010), Utar (2014)), concern only textile and clothing products. When examining labor reallocation following general trade liberalization episodes, general equilibrium effects and spill-overs from other industries often convolute results.[12] In addition to helping establish causality, utilizing removal of MFA quotas to examine workers' adjustment to a low-wage import shock also helps relieving such concerns.

This paper complements studies that use a structural approach to workers' adjustment to trade shocks. Using structural empirical models some studies aim at recovering mobility costs that workers face to switch sectors (e.g. Artuc, Chaudhuri and McLaren (2010), Dix-Carneiro (2014)) or focus on efficiency implications of labor market frictions (e.g. Utar (2009)

[11] Among notable examples in this literature see, for example, Wacziarg and Wallack (2004) for a cross-country study of labor reallocation that uses aggregate data and Menezes-Filho and Muendler (2011) that uses worker-level data from Brazil.

[12] In the context of developing countries, Goldberg and Pavcnik (2007) also points out that most governments often implement trade reforms concurrent with other economy-wide policy changes, making it even harder to isolate the effects of trade.

and Cosar (2013)), and others analyze the relationship between trade and wage inequality in the presence of search frictions (e.g. Helpman, Itshoki, Muendler and Redding (2014)). This paper's findings empirically inform structural studies in modeling workers' adjustment. First this paper shows that workers' adjustment costs are not limited to mobility frictions that are potentially driven by search or relocation costs as mostly emphasized in the literature. Workers face substantial adjustment costs due to lost occupation and industry-specific human capital in their new environment after making the right moves, that is after getting into other full-time jobs in growing sectors. This paper also shows that adjustment costs are substantially heterogeneous not (only) due to heterogenous mobility costs that workers face to switch jobs and sectors but also, and maybe more importantly, due to the extent to which the human capital is tied to the initial sector as reflected in workers' age, education and especially occupation.

In the next section, I describe the data used in this study and lay out the framework of the empirical analyses with background information on the import quotas and Danish social and labor market institutions. A description of the empirical strategy is provided in Section 3. I present and discuss my results on the impact of the trade shock and workers' subsequent adjustment to the shock by moving between jobs and sectors in Section 4 as well as whether trade leads to self-employment or exit from the labor market. The adjustment process was smooth for some workers and very costly for others. This heterogeneity of trade-induced adjustment is examined in Section 5. The section especially highlights the role of the loss of occupation specific human capital as an adjustment hurdle to manufacturing workers as they are pushed away from the jobs and the industry that they are trained for. It is then shown how this causes workers to rebuild human capital through education. I examine workers' income recovery in Section 6 and finish by offering some concluding remarks in Section 7. Supplemental analyses and a more detailed description of the data-sets are provided in an online appendix.

2 Data and Empirical Framework

2.1 Data

The main database used in this study is the Integrated Database for Labor Market Research, IDA, which is comprised of person, establishment, and job files. The person files contain

annual information on all persons of working age residing in Denmark with a social security number. The establishment files contain annual information on all establishments with at least one employee in the last week of November in each year. The job files provide information on all jobs that are active in the last week of November in each year. Information from the IDA database is complemented with a domestic production data-set (VARES) that covers all manufacturing firms with at least 10 employees, and an annual longitudinal data-set that matches firms with their employees (FIDA). These data-sets are from Statistics Denmark (Danmarks Statistik).

For each individual I observe, among others, annual salary, hourly wage, hours worked, industry code for their primary employment, the overall position in the labor market, occupation, education level, demographic characteristics including age, gender and immigration status, and total salaries obtained from all jobs held within a year. The IDA database provides information on hours worked as well as detailed occupation and education levels of employees. This facilitates an analysis that disentangles the effect on workers' per year earnings of changes in hours worked from the effect of changes in hourly wages. It also allows me to carefully examine the adjustment experience in relation to workers' initial occupation and education. The fact that the IDA database contains information on everybody regardless of their labor market status as long as they are between 15 and 74 years old gives substantial advantages over random samples or matched employee-employer data limited to workers who are formally employed. It allows me to conduct a detailed study of the effect of a policy change on the workers of a single industry and their adjustment to the change as they move into other jobs, other industries and in and out of the labor market. Arguably, this provides the most true to life look at how people are affected and adjust, when the environment in which they make their living is substantially transformed by globalization.

There are around 13,000 workers employed in the T&C sector in 1999. For the purpose of this study I select all workers with primary employment in the T&C sector in 1999 who were between 20 and 67 years old throughout the sample period of 2002-2010. Table A-1 presents sample information from the 1999-cross section of workers' demographic, education, occupation and workplace characteristics. The average worker was 39 years old in 1999. That is, an average worker was roughly in the middle of his/her career span. The share of female workers is 57 %, and 7 % are immigrants (Table A-1). The T&C industry has generally had a high proportion of female workers due to the nature of the manual labor involved (sewing, knitting, cutting, etc..). But due to globalization forces in general, or developments

in international production sharing and technological changes in particular, the ratio of female workers to male workers has been decreasing steadily in Denmark as well as in other advanced countries since the 1980s (Olsen, Ibsen, and Westergaard-Nielsen (2004)).

Information on MFA quotas is reported in the Système Intégré de Gestion de Licenses (SIGL) database which is constructed by the European Commission and is publicly available.[13] The administrative quota categories as reported by SIGL are mapped to CN 8 digit products based on Combined Nomenclature 1999.[14] The Danish production database, VARES, is used to identify firms domestically producing the goods that were subject to the import quotas for China. This data-set aims at providing information on industrial goods that are produced within the country at the detailed product level and constitutes the basis for the industrial commodity production statistics of Denmark. Firms that in 1999 domestically produce (at the 8-digit Combined Nomenclature (CN) level) goods that are subject to the MFA quota removal for China are identified, and through FIDA, the firm identification numbers are mapped with worker-level information. In the year 1999, about half of the workers (46 %) are exposed to increased import competition in the sense that they are employed at a firm that will subsequently be affected by quota removals as a consequence of China's accession to the WTO. Table A-2 reports the characteristics of workers initially employed at firms that were exposed to import competition, versus workers that were not exposed to import competition separately. Workers have similar age, experience, education and wage levels in both groups. The percentage of operators and assemblers in both the treated and untreated groups are almost the same at 41.6 % and 41.3 % respectively, showing that production workers make up a substantial part of the workforce in both groups.

Table A-2 also shows that workers' initial firms face similar employment trends before the shock regardless of their quota producing status. Quotas covered a wide range of both textile and clothing products ranging from bed linens to synthetic filament yarns to shirts but they did not cover all products within each broad product category. Since firms producing both materially and technologically similar products may have or not been exposed to the increased competition, utilizing MFA quotas at a detailed product-level is important. See

[13]The SIGL manages licences for imports of textiles, clothing, footwear and steel to the EU. The textile and clothing license database is classified according to 163 grouped quota categories defined by the EU.

[14]See the online appendix for details of matching procedure. Annex I of the "Council Regulation (EEC) No 3030/93 of 12 October 1993 on common rules for imports of certain textile products from third countries" is used as a main reference for the concordance between quota categories and the CN 8-digit products. The annex is available at the SIGL.

the online appendix for more details on this.[15] In the next section I will provide more information on these quotas and the changes surrounding the industry.

2.2 Trade in Textile and Clothing and the Surge of Imports from China

Due to its political sensitivity as a traditionally labor intensive industry, world trade in T&C was excluded from the agreement when GATT was signed in 1948 and continued to be governed by bilateral agreements. As the number of agreements grew, the Multi-fibre Arrangement was introduced in 1974 to govern the world trade in T&C. Under this agreement a large portion of T&C export from low-wage developing countries to developed countries was subject to physical quotas. The arrangement provided 'temporary' protection for developed country T&C industry against competition from low-wage country products.[16] Denmark as a member of the EU (formerly the European Community) since 1973 was not an important actor in determining these quotas as most MFA quotas were negotiated for the EU as a whole and have been managed at the EU level since 1993.

In 1995 the Agreement on Textiles and Clothing (ATC) replaced the MFA, and provisions were made for phasing it out in four steps over a period of 10 years. Quotas were to be eliminated equivalent to 16 percent of 1990 imports at the beginning of 1995, 17 percent at the beginning of 1998, 18 percent at the beginning of 2002, and the remaining 49 percent at the beginning of 2005. By being outside of the WTO during the 1990s, China did not benefit from the first two phases of quota abolishment. One of the immediate changes that WTO membership brought to China was dismantling of the first three phases of MFA quotas on China in January 2002 and allowing it to benefit from the scheduled last phase in January 2005.[17]

Although the removal of the import quotas started in 1995, Phase I and II removals did

[15]For example, within the 6-digit industry Textile Weaving, 54 % of workers were employed in quota producing firms. Similarly within Manufacturing of Made-up Furnishing Articles, 32 % of workers were exposed to the competition via their quota product producing employers.

[16]The MFA was initially agreed on for four years, but it was extended several times until 1995 (Spinanger (1999)).

[17]Due to an excessive surge of Chinese imports in the first few months of 2005 at the EU ports in response to the final phase of the quota removal, the EU retained a few of the quota categories until 2008. This event is popularly referred to and publicized as the "Bra War". Since the sample period extends over 2008, those temporarily retained quotas are also included in the current analysis.

not effectively trigger increased competition for at least two reasons: First, under ATC the selection of MFA products to be integrated into the normal WTO system was left to the importing countries/legislatures and the EU started its phasing out processes by integrating mainly products or MFA categories with no quotas vis-à-vis WTO members. During the first two phases, the EU integrated 34 MFA categories, but removed only a few existing quotas vis-à-vis WTO members (OETH, (2000)). Second, among the exporting countries subject to the MFA quotas, China was facing the largest number of quotas with the highest quota utilization rates. Except for China, the exporting countries with the highest quota utilization were India, Pakistan and Indonesia. None of these countries had any active quotas removed in Phase I or II.[18]

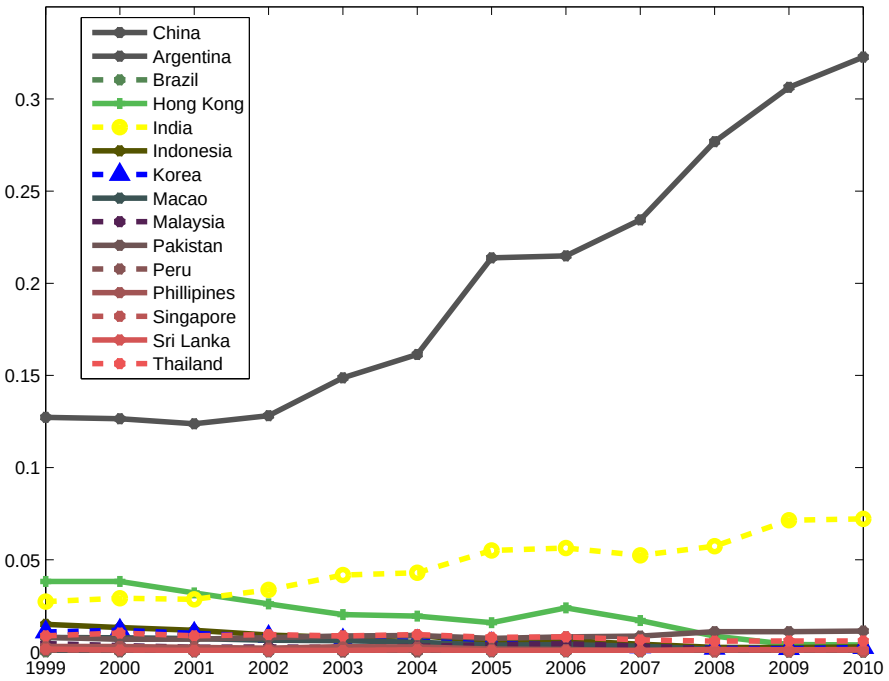

Figure 1: Import shares of China and other developing countries subject to MFA quotas in Danish Textile and Clothing Imports 1999-2010 (Source: Statistics Denmark)

The abolishment of the quotas for China led to a dramatic surge in Chinese T&C imports into the formerly protected countries. In 1998, China's share of T&C import in Denmark

[18]For Indonesia all active quotas imposed were subject to Phase IV removal except two quotas (category 21 and category 33) which were subject to Phase III removal and were removed in 2002. For India there were only two quota categories that were subject to Phase III removal in 2002 (category 24 and category 27). The remaining fifteen categories for India were removed in 2005. Only one quota category regulating imports from Pakistan was removed in Phase I, but it was an inactive quota with a 0 percent utilization.

was a little over 10 % compared to 2.8 %, 0.7 % and 1.3 % respectively for India, Pakistan and Indonesia. Figure 1 shows the evolution in T&C import shares of China compared to other developing countries subject to MFA quotas throughout 1999 to 2010. By 2010 China's share reached 32 %, while the respective shares of India, Pakistan and Indonesia were 7 %, 1 %, and 0.3 %. The image of floodgates opening is an apt one. Using transaction-level import data, Utar (2014) shows that the MFA quotas were binding for China and both the 2002 and the 2005 abolishments cause a very significant surge of MFA goods from China in Denmark with associated decline in unit prices of these goods. Khandelwal, Schott, and Wei (2013) shows that the abolishment of quotas for China lead to an efficiency gain in Chinese exports and finds that misallocation of the MFA quotas by the Chinese government during the quota regime played an important role in the resulting surge of lower priced Chinese goods in response to the removal of these quotas for China.

2.3 Labor Market

The labor market in Denmark is characterized by liberal hiring and firing regulations. Firms are not burdened by monetary compensation when firing. In case of lay-offs they are not required to give advance notification to workers paid on an hourly basis regardless of their tenure.[19] In the Global Competitiveness Report 2013-2014 Denmark is one of a few countries in the world with estimated redundancy/firing costs of zero. Provided that the maximum working hours are respected, there are no restrictions on weekend or night work.[20] This high level of flexibility of firing and hiring practices is combined with a high level of publicly provided social protection. The system is generally referred to as a 'flexicurity' system. In 2006 the Danish employment rate was 77.4 percent (highest among the EU), and the unemployment rate was 3.9 percent (Madsen (2008)).

The social protection that workers enjoy is managed by two parallel administrative systems; one governs unemployment insurance and active labor market policies (ALMP) and the other governs active social policies and provides welfare (and unemployment) benefits. The first system is a membership based, voluntary system. A member of the first system, the unemployment insurance fund (UI), will receive generous unemployment insurance when

[19]For hourly paid workers employed under collective bargaining agreements, in principle such agreements may contain provisions for tenure dependent advance notification.

[20]Denmark follows the same general rules laid out by the EU with a 48 hour maximum working week and a minimum daily rest period of 11 hours.

unemployed. Around 80 percent of the labor force is a member of this system (Kluve et al. 2007) and 87 % of the workers in the sample were members of the unemployment insurance fund in 1999 (Table A-1). Workers who are not part of the unemployment insurance fund receive welfare benefits for as long as they are unemployed. Denmark has a very comprehensive and large scale ALMP which started in the late 1970s and underwent a major reform in 1994. Workers who are part of the UI fund have obligations to participate in ALMP offers in order to keep their eligibility status. However any unemployed person, whether a recipient of UI benefits or welfare benefits, is subject to the ALMP measures.[21] The type of programs ranges from job search assistance to employment and training programs.[22] As a result, the long term unemployment rate (in total unemployment) is generally low in Denmark compared to the OECD average. In 2008, it was 13.5 %, compared to, for example 52.5 and 10.6 % for Germany and the US respectively (OECD Employment Database 2013).

The Danish labor market is also characterized by a high union density. The number of union members as a ratio of all wage and salary earners, was 72 % in 2004 (Visser, 2013). The unionization rate in the sample was 76 % in 1999 (Table A-1). While there is no minimum wage requirement in Denmark, wages are to a great extent determined by collective wage bargaining agreements. The coverage of collective wage bargaining agreements over all wage and salary earners was 85 % in 2004 (Visser, 2013).[23] Thus the two main characteristics of the Danish labor market are that it exhibits relatively rigid wage determination and highly flexible and liberal firing and hiring regulations.

3 Empirical Strategy

To derive a causal relationship between trade and workers' outcomes, I exploit the exogenous trade shock due to China's accession to the WTO which triggered the removal of the MFA

[21] This is because people who are not a member of UI are subject to active social policies and active social policies contain essentially the same type of programs as ALMP programs.

[22] Employment programs are designed for unemployed people to gain work experience in either the private or the public sector. Private sector employment programs consist of programs in which the participants work in a private firm. During the program period the participants receive a wage subsidy (paid to the employer). In public sector employment programs the participants either work in a public institution or in a special employment project managed by the municipalities e.g. snow clearing for senior citizens, nature preservation etc..

[23] This is one reason why the occupation information provided by Statistics Denmark is quite reliable and detailed. Occupational codes matter in Denmark as they influence a worker's wage due to a collective bargaining system. Employers and labor unions pay close attention to occupational codes.

quotas.[24] I start with measuring differential labor market outcomes among workers under direct threat of increased competition through the removal of quotas in comparison to other textile and clothing workers using a simple difference in difference (DID) analysis as follows:

$$\ln X_{it} = \alpha_0 + \alpha_1 AffW_i * Dum02_t + \delta_i + \tau_t + \epsilon_{it} \tag{1}$$

where $Dum02_t = 1$ when year $\geqslant 2002$ and 0 otherwise. X_{it} is worker i's outcome in year t. These are labor earnings, income, hourly wages, hours worked, days worked and the amount of time spent as unemployed. The treatment variable $AffW_i$ is an indicator variable that takes the value of one if in the year 1999 worker i is employed in a firm that domestically manufactures a product that with China's entry into the WTO is subject to the abolishment of the import quotas for China, and zero otherwise. The treatment variable is interacted with the WTO time dummy, $Dum02_t$, to capture the differential effect on affected workers, employed at firms exposed to increased competition with China due to the MFA quota removals, compared to other textile workers, employed at firms that were not exposed to increased competition due to the MFA quota removals.[25]

The aggregate trends in the industry and in the labor market are controlled for by using year fixed effects, τ_t. It is possible that workers that were employed by the exposed firms are systematically different than the rest of the T&C workers or that the exposed firms were systematically different from other T&C firms. All time-unvarying differences across workers and across their initial firms such as gender, occupation, age, education, initial wage, organizational and technological structure of initial firms are controlled for by worker fixed effects, δ_i. The coefficient estimates for α_1 will measure the impact of trade shock on workers' outcomes due to the textile quota abolishments for China in the years after its entry into the WTO.

[24] While the ATC provided a schedule for gradual dismantling of MFA quotas already in 1995, removal of MFA quotas for China depended on whether and when it would join the WTO. During the long period of China's negotiation for WTO membership, mainly with the US and EU, there was a great deal of uncertainty about the membership and its timing. "China's entry into the WTO is far from a foregone conclusion. It has been trying to join the multilateral trading system since 1986. Its hopes have been disappointed many times before."–quoted from an article titled "China and WTO" published in the Economist on April 1, 1999. This uncertainty was a recurring theme in articles in the Economist from 1999 until the end of 2001. See also The Economist (2000a) and The Economist (2000b).

[25] Utar (2014) documents a significant overlap between firms that were affected by the two quota removals for China in 2002 and 2005. The majority, 87 percent, of the firms that produced goods subject to 2002 quota removal (Phase I-II-III) were also producing goods subject to Phase IV quota removal.

An important challenge for empirical strategies that rely on industry-wide import measures to identify the impact of trade with China is that industries that are subject to greater import competition may be exposed to other shocks that can be correlated with trade with China. For example, advances in communication technology or in transportation that lower the cost of offshoring would affect labor-intensive industries more, driving up their import from China disproportionately. The empirical strategy here is free from this potential contamination because it utilizes within-industry across firm differences in exposure to trade with China due to an exogenous policy change. The other factors including technology shocks and the secular declining trend in the industry are conditioned out by focusing on the differential outcomes of T&C employees employed by the exposed firms compared to other T&C workers after controlling for aggregate shocks and worker fixed effects. These estimates on the other hand can be viewed as a lower bound of the low-wage competition impact because they are conditioned out of the general declining trend of the industry even if this is partly caused by trade factors.

Utar (2014) shows that the MFA quota removal for China leads to a significant decline in employment in firms producing MFA goods. In the presence of labor market frictions, the displaced workers from these firms are likely the ones who experience disproportionate decline in their earnings. But they will also switch to other jobs, and subsequently partially or fully compensate for their initial loss. The impact that is captured by α_1 is an average impact over the nine years period. In order to disentangle the impact across different jobs that workers hold subsequently in different sectors and examine the nature of adjustment frictions, I use the following baseline regression:

$$\tilde{X}_i = \beta_0 + \beta_1 AffW_i + Z_i^W + Z_i^F + \epsilon_i \tag{2}$$

where

$$\tilde{X}_i = \sum_{t=2002}^{T=2010} \frac{X_{it}}{\bar{X}_{it_0}}$$

is the cumulative outcome variable, say wage earnings, over 2002 to 2010, normalized by the annual outcome in the initial, pre-shock, year, t_0, for worker i employed in the textile and clothing industry as his/her primary employment in 1999.[26]

[26]This approach is similar to the one used by Autor, Dorn, Hanson and Song (2014), adapted to the context of this paper.

The vector Z_i^W contains controls for worker i's characteristics in the year 1999: age, gender, immigration status, occupation categories, education level and the logarithm of the average hourly wage.[27] Further, Z_i^W includes indicator variables for worker i's union membership and unemployment insurance membership status in year 1999. Z_i^W also includes information on worker i's labor market experience before 1999. First, this is the cumulative sum of the percentage of working time worker i spent as unemployed within each year since 1980, and the number of years of labor market experience before 1999. The vector Z_i^F contains controls for the workplace of worker i in 1999: the logarithm of the average hourly wage paid in the workplace in 1999, and the separation rate in 1999 as measured by the percentage of employees that left the workplace since the previous year.

The cumulative outcome contains the sum of shocks over the periods of abolishment and afterwards. I normalized it by workers' pre-MFA quota abolishment outcome, $\bar{X}_{it_0}$.[28] The estimates of β_1 will capture the cumulative impact of the low-wage import shock over the nine year period among workers, all of whom were employed by the same initial industry and have similar demographic-occupational-educational background, wage, unemployment history, and workplace characteristics before the quota abolishment period. I will then examine workers' adjustment by decomposing the cumulative effect captured by β_1 across different jobs that workers hold subsequently.

The treatment variable is a zero-one dummy which gives equal weight to workers as long as their initial workplaces were producing any 8-digit MFA-quota goods domestically. But many firms are multi-product firms. It is possible that some firms produce some quota goods domestically while offshoring others. Utar (2014) shows that such firms are less negatively affected by the removal of quotas for China. Some firms may not have substantial revenue share in quota products. To address this, an alternative, continuous treatment variable is constructed using the revenue share of domestically produced MFA quota goods. Let $CAffW_i$ be the revenue share of domestically produced MFA goods of worker i's employer in 1999 and estimate equation 1 and equation 2 using $CAffW_i$ as a treatment variable.

[27] Occupation categories are dummy variables for top-level and executive positions, intermediate-level occupations, base-level occupations and the outside category. The outside category consists of workers with auxiliary or unspecified occupations. Education controls are dummy variables for workers with at least some college education, workers with vocational education and workers with at most a (non-technical) high school degree. The logarithm of the average hourly wage is calculated for years 1999 and 2000 to smooth out temporary effects.

[28] To reduce measurement errors, I normalize it using the 1999-2000 average of the relevant outcome variable.

This way, exposed workers employed in firms domestically producing a quota product that does not constitute substantial revenue share will be given less weight than exposed workers whose workplaces concentrate heavily on domestic MFA good production.

4 Effects of Import Competition from China and Workers' Adjustment

4.1 The Impact on Workers' Future Earnings and Employment

4.1.1 Average Effects

Table 1 column (a) presents results from estimating equation 1 for earnings, income, employment and unemployment measures. The estimation sample in column (a) consists of all employees of the textile and clothing sector in 1999 who were born between 1943 and 1982 if the employment relationship is considered as primary (instead of secondary or other types of side jobs) from the perspective of the employee as recorded in November.

The results show that T&C workers that were under direct threat from the MFA removals experienced a significant disproportionate decline in their annual labor income compared to other T&C workers. The coefficient estimate in Panel A in column (a) indicates an about 5 % decline in annual salary from the primary employment. In Panel B the dependent variable is total labor income, which is defined as the summation of all wages earned from all occupations held within a year. The impact is only a bit less, it is about 4.2 % and significant at the 0.1 percent. The salary information is typically reported by the employer. As a robustness check, I also used total salaries information which is directly reported by the person to the tax authorities. The DID coefficient estimate obtained using this administrative record of total salaries shows an about 6.6 % disproportionate decline in affected workers' total salaries (panel C of Table 1 column (a)). The last income measure considered is the personal income that includes labor income as well as income from self-employment, personal business income, pension income, unemployment insurance, government transfers, and other cash benefits excluding wealth/capital income. Unemployed workers receive compensating benefits from their unions and from the government, and the adjustment could also involve working as self-employed or going into early retirement. The results for annual personal income shows

no significant effect and indicates that these potentially compensating benefits, on average, cover the loss in annual labor earnings that was caused by the MFA trade shock.[29]

The negative effect of the import shock in labor earnings could be a result of decline in hourly wages as well as a decline in the number of hours worked within a year. Results presented in panel E through H in Table 1 show that the trade shock causes decline in labor earnings through decline in the number of hours worked instead of through hourly wages. Results in column (a) of Panel I and J show that workers who are directly exposed to the import shock also experience a significant disproportionate decline in the average number of days worked within a year[30]. The reduction in the number of days worked is not a voluntary development as evidenced by the significant increase in the unemployment measure.[31] On average the import shock caused by dismantling of quotas for China associated with China's WTO accession causes a significant increase in unemployment among Danish T&C workers. These observations invite a closer look at the types of adjustment that displaced workers experienced.

Columns (b) through (d) in Table 1 present the estimation results for equation 1 conducted separately across workers with different educational backgrounds: among workers with college education, with vocational education and among workers with at most a (non-technical) high school degree. The results reveal that the average impact of the negative shock is not homogeneous across workers with different educational backgrounds. The negative effect is concentrated among workers with lower level of education. The impact of the MFA shock on future labor earnings among workers with at most a high school diploma is negative and significant. For these workers the results show an about 6.4 % decline in primary annual salary. The results on annual hours worked, hourly wages and unemployment reveal that the declines in earnings are due to decline in employment.

[29]While the number of observations vary due to varying number of observations with zero values as well as due to availabilities across different sources, when income measures are run on a sample where all other income variables are available (N=109701), the respective coefficients of column (a) from Panel A through Panel D are: -0.050^{***}, -0.035^{***}, -0.032^{***}, and -0.012^{*}.

[30]While most of the workers have one occupation per year, if a worker works in more than one occupation either because (s)he changes occupation or has additional jobs, this measure shows the average across all occupations. Conducting the same analysis over the dependent variable measuring the number of days worked for the most important job (in terms of time spent) within a year provides the estimate of α_1 as -0.044^{***}.

[31]The dependent variable in Panel J of Table 1, the cumulative unemployment index, is defined as the cumulative sum of the percentage of working time spent as unemployed within each year since 1980.

Table 1: Impact of the Chinese Import Shock on Earnings, Income, Employment, and Unemployment

Sample Period: 1999-2010		Workers with primary employment in the T&C sector in 1999 sampled by education			
		(a) **All**	(b) **College Education**	(c) **Vocational Education**	(d) **at most High School Diploma**
		$\widehat{\alpha_1}$	$\widehat{\alpha_1}$	$\widehat{\alpha_1}$	$\widehat{\alpha_1}$
A	Annual Salary (primary employment)	-0.051***	-0.049	-0.028	-0.066***
		(0.011)	(0.030)	(0.015)	(0.016)
B	Total Salaries	-0.043***	-0.007	-0.035*	-0.057**
		(0.011)	(0.031)	(0.017)	(0.017)
C	Total Salaries - personal tax records	-0.068***	0.017	-0.056*	-0.111***
		(0.016)	(0.037)	(0.023)	(0.025)
D	Personal Income incl. unemployment insurance	-0.007	0.019	0.005	-0.020
		(0.007)	(0.021)	(0.010)	(0.010)
E	Total Annual Hours Worked (primary employment)	-0.044***	-0.039*	-0.036***	-0.052***
		(0.007)	(0.035)	(0.022)	(0.022)
F	Total Annual Hours Worked (all occupations)	-0.081***	-0.058	-0.080***	-0.095***
		(0.014)	(0.035)	(0.022)	(0.022)
G	Hourly Wage (primary employment)	0.008	0.012	0.004	0.013*
		(0.004)	(0.014)	(0.007)	(0.006)
H	Hourly Wage (avg. across all occupations)	0.010*	0.019	0.011	0.006
		(0.005)	(0.015)	(0.007)	(0.006)
I	No of Days Worked Within a Year	-0.047***	-0.019	-0.064***	-0.046**
		(0.010)	(0.028)	(0.016)	(0.015)
J	Cumulative Unemployment Measure	0.106***	0.019	0.084***	0.150***
		(0.012)	(0.033)	(0.021)	(0.017)

Notes: Estimation of equation 1. All regressions include year and person fixed effects. Dependent variables are listed in the table. All dependent variables are in logarithmic form. A constant is included but not reported. The cumulative unemployment index, in Panel J, is defined as the cumulative sum of the percentage of working time spent as unemployed within each year since 1980. Due to differences in data sources and the logarithmic transformation, the number of observations vary. The number of observations from Panel A through Panel J in column (a) are 109839, 119482, 120998, 135374, 106066, 69289, 106066, 69289, 69261, and 112719 respectively. The number of observations from Panel A through Panel J in column (b) are 13231, 14039, 14099, 15059, 12870, 8474, 12870, 8474, 8472, 12117 respectively. The number of observations from Panel A through Panel J in column (c) are 38875, 41857, 42288, 46970, 37939, 24447, 37939, 24447, 24438, 38041 respectively. The number of observations from Panel A through Panel J in column (d) are 55304, 60891, 61855, 70136, 52914, 34784, 34768, 59699 respectively. Robust standard errors clustered at worker-level are reported in parentheses. *, ** and *** indicate significance at the 5 %, 1% and 0.1% levels respectively. Data Source: Statistics Denmark.

The impact of the MFA shock on future employment among workers with vocational training is also found to be very substantial. This group of workers contain high-skilled textile operators, clothing, knitting operators, and tailors. It is important to remember that these magnitudes are relative to other textile workers with the same educational backgrounds, so the impact found here can be regarded as a lower bound of the full impact that these workers experience in an industry in decline in Denmark.

The impact of the low-wage import shock on the other hand is not significant on college educated T&C workers. This could be either because college educated T&C workers were not affected significantly at their competition exposed workplaces or because they recovered from the shock fast enough that the average effect throughout the decade becomes insignificant. I will return to this below.

In order to make sure that the results are not driven by potential existing trends that for some reason are felt disproportionately among quota-producing firms or among their employees, equation 1 is estimated in a pre-sample period of 1990-1999 where the WTO dummy is replaced with a dummy that takes 1 on and after 1995. This period spans Phase I and II removals, so any potential effects of these and concurrent events would be captured. As shown in Table 1 in the online appendix the results are not driven by potential pre-trends.

With a long time dimension of data, possible serial correlations in the dependent variables may lead to under-estimation of standard errors in a difference-in-difference setting (Bertrand, et al. (2004)). To address this potential problem, the analysis is also conducted with data which is aggregated into two periods: pre-and post-WTO. These results, which are presented in the online appendix (Table 2), agree with the results presented in Table 1.

The analysis is also conducted using the continuous treatment variable, $CAffW$, where workers are assigned weight in the treatment group proportional to the degree of exposure of the firm of their initial employment. Results from this analysis are presented in Table 3 in the online appendix. Utilizing additional cross-sectional variation in the degree of exposure to the shock at the initial firm results in larger magnitudes of coefficient estimates.

4.1.2 Cumulative Effects

In order to focus on workers' adjustment during the post-WTO accession years of China equation 2 is estimated using cumulative worker outcomes among workers who were born

between 1943 and 1982 with their primary occupation within the T&C sector in 1999. For each worker cumulative variables are constructed using workers' annual earnings, employment, and annual hours worked in their primary employment.[32] Table 2 presents these results. The cumulative employment variable is simply the number of years employed with positive wage earnings between 2002 and 2010. Any worker who has an employment at the end of November with positive salary is regarded as 'employed' for that year regardless of the length of that employment relationship. The cumulative earnings and cumulative hours variables are normalized by the pre-shock value of the respective measure: annual earnings and annual hours worked.

Column (a) of Table 2 presents the results with no worker and workplace controls and shows negative and significant effect of the trade shock on workers' cumulative earnings and hours worked with no significant effect on the number of post-shock years with at least some employment. Workers exposed to the trade shock may be systematically different from other textile workers and these potential differences may be correlated with their future labor market performance. After controlling for workers' demographic differences (age, gender, immigration status) the results presented in column (b) of Table 2 for cumulative earnings and cumulative hours are still negative and significant with very similar magnitudes. Additionally controlling for their skills and occupations (education, initial hourly rate, occupation categories), their past performance (unemployment history and labor market experience), union membership, UI membership and initial workplace characteristics that may have an affect on workers' accumulation of knowledge and experience, the coefficient estimates for cumulative earnings and cumulative hours regressions are still significant at the 0.1 percent level with larger magnitudes. The coefficient estimate of cumulative employment stays insignificant.

These results show that workers that were under direct threat from the WTO accession of China experienced a significant decline in their earnings compared to other observationally similar workers employed in the same initial industry. The effect on their cumulative earnings amounts to 70 % of a pre-WTO accession annual wage (column (d)). Measuring employment as the number of years worked with positive earnings may be too crude a measure to capture the potential effect of the trade shock on employment. These results show substantial decline in earnings per year of employment. In line with the fixed effects results presented before, they show that the earnings loses were mainly driven by decline in hours worked.

[32]Descriptive statistics of these variables are presented in Table A-3.

Table 4 in the online appendix presents estimation results of equation 2 for earnings and employment with the alternative treatment variable, $CAffW$. Using the continuous treatment results in larger magnitudes of coefficient estimates and the results are robust. The coefficient estimate for cumulative earnings imply that the differential earnings loss between a worker in the 75th percentile of exposure to competition and a worker in the 25th percentile of exposure is 64 % of an initial salary. Reported coefficient estimates for control variables show that male, older, non-immigrant workers, workers with higher-level initial occupation, and workers with a high wage initial workplace have higher cumulative earnings. Workers with higher level of experience and better unemployment history, and college educated workers have higher cumulative employment.

The fixed effects results control for potential technological differences between quota producing firms and others as identification is based on within worker changes. Further, the identification of trade exposed firms is done at a detailed product-level, and as mentioned before, quota coverage within broad products were not necessarily full, whereby the control group contains workers who were working in very similar detailed activities as workers in the treatment group. To further address the issue of potential technological differences between quota-producing and other firms, equation 2 is estimated with additional broad product fixed effects (6-digit industry dummies)[33]. In this analysis the identification of the trade effect only relies on variation among T&C workers producing the same broad product. The results presented in the online appendix (Table 5) are robust and stronger in magnitudes. The significant negative effect of China on workers' earnings, employment and hours worked is not driven by such potential technological differences, say, between workwear and netting or rope producers.

Next the impact of the initial trade shock will be disentangled from the subsequent adjustment of workers to this shock.

4.2 Workers' Adjustment by Moving across Jobs within and between Sectors

To focus on workers' adjustment to the trade shock, the workers' cumulative outcome measures in Table 2 are decomposed into a set of additive and mutually exclusive channels of

[33]There are 24 6-digit industries within the T&C industry in the Danish Industrial Classification, e.g. Manufacture of netting, Manufacture of workwear, Manufacture of made-up furnishing articles,..

adjustment: impact at their initial employers, at other employers in the T&C sector, at other manufacturing sectors, at the service sector and all other sectors, which includes agriculture, fishing, mining, and construction. Equation 2 is estimated with each of these variables as well as additional variables: earnings per year of employment, hours worked per year of employment and hourly rate per year of employment. The results are presented in columns (a) through (f) of Table 3. Since all potential sources of employment are covered in the decomposition, coefficients of the cumulative outcome variables in columns (b) through (f) will sum to the estimates of the overall trade effect in column (a).[34]

Results in Panel A of Table 3 show that a substantial negative effect on earnings was experienced at the initial employer amounting to 110 % of an initial annual salary. This loss was partially compensated for over the decade, such that the overall impact is 70 % of an initial annual salary. The results in Panel A show that this partial recovery happened mainly by workers' movement to service sector jobs. Affected workers made earnings in service sector jobs amounting to 42 % of a pre-shock annual wage more in comparison to other workers with similar characteristics and initially employed in the same industry. Earnings recovery within the T&C sector is found to be quite limited; the coefficient estimate for the earnings obtained in subsequent jobs within the initial sector is small at 4.8 % of an initial annual wage and statistically insignificant. Estimates in Panel B show that the increased competition with China caused a significant loss of employment of workers at their initial (exposed) employers amounting to one year's work. The positive and significant coefficients of columns (c) and (e) in Panel B also show that affected workers offset their employment loss at the initial firm by moving across jobs within their industry, but to a much larger extent by moving to service sector jobs. Despite having higher likelihood of switching jobs within their initial industry, affected workers do not significantly recover their initial earnings losses in these jobs.

Coefficient estimates in Panel C show that affected workers had a significant reduction in their earnings per year not only at their initial employer, but also at the service sector jobs that they subsequently moved to. Actually the reduction in per year earnings is only 2 % at the initial firm, and weakly significant, but it is 11 % at subsequent service sector

[34]The number of observations will vary for earnings, hours, and hourly wage per year of employment. For example, earnings/hours/hourly wage per year of employment at jobs in the service sector is not defined for workers who never had a primary employment in the service sector throughout 2002-2010. Hence only the decomposition of the cumulative outcome variables across different jobs that workers had during the period will sum to the estimates in column (a).

jobs. That is, manufacturing workers affected by the Chinese import shock are found to move disproportionately to a less well paying situation in the service sector, but this move is also the main source of recovery from their initial employment and earnings loss. Per year earnings reductions in subsequent service jobs could be because these jobs offer less per hour. It could also be that workers work less hours, maybe because these jobs are mostly part-time or short-term jobs in the service sector. Another possibility is that affected workers have frequent disruptions in these jobs and difficulty in maintaining their employment.

The results presented in Panel D of Table 3 on cumulative hours worked confirm that employment has been shortened significantly at the initial firm. Affected workers experience a decline in hours worked at the initial (exposed) firms amounting to one pre-abolishment year of hours worked. Confirming the finding with the employment measure, affected workers are also found to work relatively more hours in service sector jobs following the trade shock. But comparing the estimates in column (e) between Panel B and Panel D implies that affected workers work less hours per year of employment in the service sector. Results presented in Panel E on hours worked per year of employment confirm this. More specifically, the Chinese import shock causes an increase in cumulative hours worked in service sector jobs by about 44 % of pre-abolishment annual hours worked. At the same time, affected workers work 10 % less hours per year in these service sector jobs in comparison to observationally similar workers that were initially employed in the same industry. Results on the hourly wage per year of employment (normalized by the initial hourly wage) presented in Panel F show only a weakly significant minor effect of the trade shock at the initial firm and show no significant effect on hourly wages at the subsequent jobs.

These results show that the decline in average earnings observed in the service sector is not because trade causes workers to move to less well-paid (per hour) service sector jobs or because trade exposed workers experience subsequent reductions in their hourly rates, but because they work less hours. Manufacturing workers exposed to the trade shock may have difficulty in finding full-time or longer-term service sector occupations or occupations that are suitable to them, and hence they may have a higher likelihood of leaving or losing their employment. If so, they would spend more time as unemployed within a year as the results presented in the previous section also show.

Table 6 in the online appendix presents the same analysis with the alternative treatment variable, $CAffW$ and the results are similar and stronger in magnitudes. The cumulative

workers' outcome variables are based on the workers' primary employment.[35] An alternative definition of the cumulative earnings can be inclusive of all occupations held by workers within a year. If workers change their employment within a year or hold several part-time jobs in the service sector, then the earnings compensation at the service sector is expected to be higher when one considers all labor earnings. Corresponding results for the cumulative earnings, cumulative employment and earnings per year of employment that are based on all occupations, primary or not, held by a worker within a year are presented in the online appendix (Table 7). Since industry information is not available for all jobs that workers hold, the decomposition exercise in this analysis is still based on workers' primary industry affiliation. The results are similar and show a negative and significant effect of the trade shock on workers' cumulative total earnings, amounting to 48 % of an initial annual total earnings. While the total recovery in the subsequent service jobs is found to be 51 % of an initial annual total earnings, the results also show that even when one considers earnings from additional jobs, the reduction in per year earnings in subsequent service jobs amount to 10 % of initial annual total earnings. These results confirm that workers face adjustment problems even after finding employment in the service sector.

4.3 The Service Sector: A Safe shore, fraught with perils

Switching to the service sector, workers were able to fully compensate for the initial loss in employment in terms of calendar years with employment over the decade following the WTO accession. But the loss of employment is only partially compensated for when measured in hours worked. To see the cumulative impact over time, equation 2 is estimated separately for each year from 2002. In these regressions the cumulative outcome variable is the cumulative sum of the outcome variable from 2002 until the year of the regression normalized by the initial value of the respective outcome variable.

Figure 2-(a) shows the coefficient estimates ($\widehat{\beta_1}$) and the confidence interval from the year by year regressions of cumulative employment. The impact of trade on the cumulative employment is negative and significant in the first three post-WTO accession years. The negative impact of the trade shock on employment stabilizes between 2005-2008 and the effect becomes statistically insignificant starting 2009. That is, by 2009 the initial employment loss

[35]Since the information on workers' employment and occupations provided by IDA is collected from their primary employment, the cumulative earnings from a primary employment is the most appropriate choice of earnings measure for this analysis.

has been fully compensated for. Figure 2-(b) shows the coefficient estimates from the decomposition analysis. The year by year coefficient estimates show that after the first few years, finding employment within the T&C industry becomes a less viable option for workers to compensate for their initial employment loss, and from 2005 onwards the service sector rises as the main absorber of workers displaced from their exposed employers. The decomposition figure also makes it clear that other manufacturing jobs are never an important source of employment recovery throughout the period.

Figure 3 shows the coefficient estimates for the effect of trade on cumulative hours worked. As opposed to the overall effect of trade on cumulative employment, the overall effect on cumulative hours worked is a continuous decline over the nine years period. The year by year coefficients for the overall effect are statistically significant at the 0.1 percent level throughout 2002-2010. Superposing the effects on cumulative employment and cumulative hours worked at the initial employer and the service sector in the same plot, Figure 4, illustrates an important adjustment friction. Almost identical coefficients for hours worked and employment in the initial firm shows that the initial trade effect is driven by loss of employment rather than decline in hours worked. Widening differences between hours worked and employment in the service sector, on the other hand, shows that moving to the service sector is not a smooth transition. Workers who move earlier probably have occupational and educational skills better suited for jobs in the service sector, while workers with less suitable skills move only after realizing, that other T&C manufacturing jobs are not viable options anymore. Such workers are more likely to experience unemployment disruptions in the service sector or alternatively more likely to end up in part-time jobs. In section 5 I will examine such heterogeneity in workers' adjustment to further highlight the nature of these adjustment frictions.

4.3.1 Part-Time Jobs or Frequent Disruptions in the Service Sector?

An important part of costs of adjustment to the trade shock is identified as a lower number of hours worked in subsequent service sector jobs. This could be either because workers who were under direct exposure to the trade shock disproportionately move to part-time jobs or because they experience difficulty in keeping stable employment in the service sector or possibly both.[36] Utilizing information on job types provided by IDA, I decompose the

[36]Using the US Displaced Workers Survey, Farber (2005) documents that during 2001-2003, 13 % of workers displaced from full-time jobs were reemployed in part-time jobs.

cumulative earnings, the cumulative employment and the cumulative total labor income recovery obtained in the service sector into full-time service jobs, part-time or side service jobs or jobs with no type information available. The results, presented in Table 4, show that affected workers do not disproportionately take part-time jobs in the service sector. Workers exposed to the trade shock have higher likelihood of moving to full-time service sector jobs. Almost all of their earnings as well as employment recovery come from full-time jobs there. These results indicate that affected workers have difficulty in keeping *stable* employment in the service sector. This finding puts a spotlight on the adjustment frictions faced by workers, as they seek to adapt to a new type of work in the service sector following a trade shock, and highlights the difficulty or slowness in making such a transition even in an environment with a relatively low unemployment rate and full-time jobs available.[37]

Table 4: Service Sector–Part-Time Jobs or Disruptions?

	(a) All Service Jobs	(b) Full-time Service Jobs	(c) Part-Time Service Jobs	(d) Unknown
Dep. Var.	**Cumulative Earnings**			
AffW ($\widehat{\beta}_1$)	0.425*	0.455**	-0.031	0.001
	(0.167)	(0.160)	(0.027)	(0.001)
Dep. Var.	**Cumulative Employment**			
AffW ($\widehat{\beta}_1$)	0.707***	0.681***	0.023	0.003*
	(0.059)	(0.056)	(0.016)	(0.001)
Dep. Var.	**Cumulative Total Labor Earnings**			
AffW ($\widehat{\beta}_1$)	0.515***	0.521***	-0.024	0.009
	(0.130)	(0.123)	(0.027)	(0.006)

Notes: The number of observations is 10521 in all columns and panels. All regressions include a constant and the full set of controls, Z_i^W and Z_i^F. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 5 %, 1% and 0.1% levels respectively. Data Source: Statistics Denmark.

4.4 Moving Outside of the Labor Market?

Workers may adjust to the shock not only by changing jobs and sectors but also by re-considering their participation in the labor market. Workers can move outside of the labor

[37]Throughout the 2006-2008 period the unemployment rate in Denmark was under 4 %. In 2008 it was 3.5 % and increased to 6.1 % in 2009 (OECD Employment Database 2013).

market for a variety of reasons including education purposes, family/maternity/health reasons, prolonged unemployment, or retirement. In Denmark there is an early retirement system that allows people to effectively be retired at the age of 60.[38] It is possible that older workers who were displaced opt for early retirement instead of going through a costly adjustment process. I analyze the impact of the import shock on the number of post-WTO accession years the person spends at a set of mutually exclusive labor market positions: at the initial employer, at other manufacturing jobs (including other T&C jobs), at service sector jobs, as self-employed, as unemployed, or outside of the labor market.[39] [40] Results of this analysis are presented in Table 5. Confirming the findings in section 4, the import shock causes workers to spend less time at the initial employer, by about a year, their likelihood of switching to other manufacturing jobs increases and their likelihood of switching to service sector jobs even more so.

Table 5 also shows that workers who are exposed to the low-wage import shock do not spend more time as self-employed, but they have higher likelihood of being unemployed. A worker has an 'unemployed' labor market status if s/he is unemployed in November and receives unemployment benefit from the UI, but is still actively looking for a job.[41] Unemployment benefit is typically administered by the respective unions for insured workers. After prolonged unemployment (continuously for 4 years) a person is no longer considered within the labor market and is not entitled to unemployment insurance through his/her union anymore.[42] Further, results presented in Panel F of Table 5 reveals that the import shock does not lead to higher likelihood of moving outside of the labor market. This result is in contrast with the American workers' experience documented by Autor, Dorn, Hanson and Song (2014). The active labor market policies used in Denmark together with generous

[38] In June 2006 the Welfare Agreement was implemented, introducing a gradual rise in the age of early retirement by six months per year from 2019 to 2022, and a gradual rise in pension age within the ordinary scheme by six months per year from 2024 to 2027.

[39] Being self-employed is treated as a separate category regardless of the specific industry (manufacturing, service, agriculture, etc..) in which the individual works as self-employed.

[40] Note that the set of labor market positions are exclusive but not exhaustive as workers can potentially be employed in the construction sector or in the agricultural sector. These non-manufacturing, non-service 'other' sectors are not included in this analysis as they are rarely an option as shown in the previous section. These labor market positions are positions of workers at November of each year as recorded by Statistics Denmark.

[41] Receiving unemployment benefit from the UI is conditional on actively looking for a job. This requires registering with the recognized employment office, maintaining a current CV in a publicly available online database, actively applying for jobs, being ready to take an employment with one day's notice and participating in active labor market activities.

[42] After four years of unemployment, unemployed people are covered by social assistance benefits specifically for unemployed people which are publicly funded and not as generous.

unemployment insurance is probably an important reason behind this difference in outcome.

Table 5: Workers' Adjustment over Labor Market Positions between 2002-2010

	Number of years	AffW ($\widehat{\beta}_1$)
A.	at Initial Employer	-1.006***
		(0.059)
B.	at Other Manufacturing Jobs	0.196***
		(0.056)
C.	at Service Sector Jobs	0.702***
		(0.059)
D.	as Self-Employed	-0.011
		(0.016)
E.	as Unemployed	0.068***
		(0.017)
F.	Outside of the Labor Market	0.054
		(0.039)

Notes: In all panels and columns the number of observations is 10521. All regressions include a constant and the full set of controls, Z_i^W and Z_i^F. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 5 %, 1% and 0.1% levels respectively. Data Source: Statistics Denmark.

To gain an aggregate perspective, Figure 5 shows the distribution of workers at the end of the sample period over different labor market positions by exposure to the trade shock. By 2010, 34 % of the control group had their primary affiliation in the service sector whereas this ratio is much higher at 45 % among exposed workers. It also shows that in 2010 25 % of both groups were outside of the labor market. Figure 5 makes it clear that the results presented here are controlling for the secular declining trend of the industry and concentrate on the pure trade effect even if this would underestimate the effect of trade, since the secular declining trend in the industry may in part be caused by globalization.

5 Heterogeneity in Workers' Adjustment to the Trade Shock

As established above, import competition leads to strong movement from manufacturing to the service sector and this trade induced broad sector switch is found to bring uncertainty and difficulty in adjusting to the new environment. It is expected that a broad sector switch

renders the part of a worker's human capital which is tied to the initial sector obsolete. By studying heterogeneity in adjustment paths of workers with different sensitivity to the potential loss of human capital as reflected in education, occupation, and age, we should be able to pin down the determinants of the frictions that workers face.

5.1 Education and Workers' Adjustment

To study paths of adjustment of workers with different skill levels, workers are sampled according to their highest attained education and the analysis of workers' adjustment is conducted separately for college educated workers, for workers with vocational education and for workers with at most a (non-technical) high school degree. These results are presented in Table 6 and in Table 7.

Results in section 4 showed that on average college educated workers were not significantly affected by the negative trade shock. But this is the average effect over the whole decade. The results in Table 6, column (b) show that college educated workers were at least as heavily hit at the initial employer as workers with lower levels of education, and that they would have earned an additional 110 % of an initial annual wage at their initial firms, had they not been exposed to the shock. The impact of the import shock was felt to a similar degree at the initial firm among workers with vocational education and workers with at most a high school diploma, amounting respectively to 120 % and 100 % of a pre-MFA abolishment annual wage. Results presented in column (b) of Panel B in Table 6 on cumulative employment as well as in column (b) of Panel A in Table 7 on cumulative hours worked reveal that regardless of workers' education, the main source of the negative wage effect at the initial firm was shortened tenure there.

The different outcomes of workers with different education levels stemmed from their ability to compensate for the initial loss, incurred due to the low-wage import shock. I find that trade increases the likelihood of switching to service sector jobs regardless of workers' education (column (e) of Panel B in Table 6), but affected workers with no college education are not able to compensate significantly for their initial earnings losses in the service sector (column (e) of Panel A in Table 6). College educated workers, on the other hand, are able to fully compensate for the initial earnings losses in subsequent service sector jobs. Comparing coefficients in columns (b) and (e) at the first row of Panel A suggest that this trade induced switch may even be a blessing in disguise for the college educated. As the broad sector switch

involves organizational and technological changes, these results are in line with the idea that highly educated workers have a comparative advantage with respect to the adjustment to new knowledge and technologies (Bartel and Lichtenberg, 1987).

Using aggregate data Autor, Dorn, and Hanson (2015) show that the effect of Chinese imports on local labor markets tends to be stronger for non-college educated employment. Utar (2014) also finds the negative effect of the import shock to be concentrated on non-college educated employees at the firm-level. The findings presented in this paper suggest that results at the region, industry and firm-level can (mis)lead to the conclusion that college educated workers are immune from the negative employment effect of trade shocks. The findings here show that successful *adjustment* to the shock is the paramount determinant of the different aggregate outcomes of employment between college and non-college educated workers.

While college education increases the adaptability of workers, workers with vocational education are at risk of losing their investment in human capital, as their education and training is largely manufacturing specific and is likely to be obsolete in the service sector. Results in Panel C of Table 6 show that for workers with vocational education the import shock causes significant decline in earnings per year of employment amounting to 8 % of an initial annual wage. The respective amount is 17 % of an initial annual wage decline for workers with at most a high school degree. The lower earnings per year for both of these groups come from subsequent employment. Results presented in Panel B and C in Table 7 on hours worked and hourly rate per year of employment show that non-college educated workers' lower earnings per year and their failure in recovering from their initial earnings loss at subsequent service jobs are due to working a lower number of hours per year in these jobs. This is especially so for middle-skilled, vocationally educated workers.

The trade shock induces a weakly significant decline in the hours worked per year of employment in these service jobs amounting to 9 % and 10 % of initial annual hours worked respectively for workers with vocational and at most a high school degree as shown in Panel B of Table 7. The earnings and employment in the service sector are further decomposed over part-time and full-time jobs and the analysis is conducted separately for workers with different education. These results, presented in Table 12 in the online appendix, show that the adjustment frictions in the service sector experienced by workers with no college education continue even after they find new full-time employment in the service sector. Analyzing education based differences in workers' adjustment across labor market positions shows that

it is primarily workers without college education who have higher likelihood of unemployment.[43] Interestingly, mid-skilled workers were found to suffer from unemployment at least as badly as unskilled workers with at most a high school degree. Trade is also found to push mid-skilled workers outside of the labor market for early retirement while pushing less-skilled workers for further education (Table 13 and Table 14 in the online appendix).

Results on cumulative employment in Panel B of Table 6 show that trade increases the likelihood of switching to other jobs within the same industry for both college educated workers and for workers with vocational education but not for workers with a lower level of education. That is, exposed workers with lower level of education face worse future employment opportunities within their initial industry compared to exposed workers with college education. Aggravating their condition, these workers have a harder time finding and keeping 'good' jobs in the service sector compared to their college educated colleagues. These results are in line with Utar (2014) that shows that the removal of MFA quotas triggered restructuring in the industry where firms increased their college educated workforce and concentrated on non-production activities. The restructuring was associated with a modest increase in hourly wages at the firm-level for college educated workers. Affected workers who were able to switch to jobs in such restructured firms were probably better able to utilize their already accumulated industry-occupation specific knowledge.[44] Results on hourly rates in Panel C of Table 7 show that affected workers with college education receive slightly higher hourly wages on average in these T&C jobs. Part of the move to other T&C jobs could be voluntary or self-initiated for college educated workers. However, seen together the results show that restructuring within T&C firms was too limited to provide an increased demand for college educated workers, and the service sector arose as the main absorber for all workers.[45]

5.2 Occupation-Specific Human Capital and Workers' Adjustment

It is interesting to note that adjustment costs overall are heavily borne by low-skill (at most high school degree) workers, but the extent of frictions experienced in the service sector are

[43] See section 3.3.2 in the online appendix for these results.

[44] These results are also in line with Hummels, Jørgensen, Munch and Xiang (2014) that shows that offshoring is associated with an increased wage premium for high-skilled workers in Denmark.

[45] Corresponding results on cumulative earnings, cumulative employment, and earnings per year of employment that are based on all occupations held by a worker within a year are presented in the online appendix (Table 11), and the results are similar.

similar between workers with mid-skill (vocational education) and low-skill workers. Workers with vocational schooling are typically skilled manufacturing workers who received several years of formalized training including both school and apprenticeship. These results imply that adjustment frictions in the service sector involve loss of industry or occupation specific human capital as workers find themselves in a new environment which they are not (yet) trained for or experienced in. This is further investigated in this section.

Table 8 presents the analysis conducted separately for workers according to occupations at their initial employers.[46] Results, presented in Panel A of Table 8, show that over the 2002-2010 period manufacturing labourers who were exposed to the shock experienced decline in their cumulative earnings equal to two annual salaries (in initial salary) relative to other observationally similar manufacturing labourers. Affected operators and assemblers experienced a significant decline in their cumulative earnings relative to other T&C operators and assemblers amounting to about one annual salary. The impact of the trade shock on the cumulative earnings of managers, professionals and technicians, clerks and other service workers as well as craft workers, on the other hand, is not found to be statistically significant. These results reveal substantial heterogeneity in the impact of the low-wage import shock on workers with different occupations.

Comparing the effect of the trade shock on cumulative earnings over the period with the impact at the initial firm (columns (a) and (b) of Panel A in Table 8), it is clear that the differences in success of adjustment after the shock experienced by workers with different occupations are very important to how negatively they are affected overall by the low-wage import shock. The initial impact of the shock ranges between 77 % and 146 % of an initial annual wage across all occupations. The effects of the shock experienced by managers, clerks and service workers as well as operators and assemblers at their initial exposed workplaces were, for example, all almost the same, around 115 % of a pre-abolishment annual wage.[47]

If the human capital accumulated through work experience is substantially specific to a firm or an industry, then workers displaced from their jobs are likely to experience larger losses. Panel B of Table 8 shows that exposed operators had a higher likelihood of moving on to

[46]Occupation classifications follow International Standard Occupational Classification (ISCO-88) major groupings. Details are provided in the online appendix.

[47]Managers include corporate managers, executives, production and operations department managers and general managers. Clerks and service workers include secretaries, office clerks and security service personnel. Operators and assemblers include weaving, knitting, cutting operators, other machine operators and assemblers. Vast majority of them are operators.

other manufacturing jobs as well as to service sector jobs. The increases in their cumulative employment in other manufacturing jobs and in service jobs amount to 34 % and 54 % of a year respectively and they are statistically significant. It can be expected that all of their occupation-specific knowledge would become obsolete in service jobs. On the other hand, they may partially utilize their initial occupation-specific knowledge in other manufacturing jobs. Kambourov and Manovskii (2009) show that occupational experience plays an important role in determining wages. Although not statistically significant, machine operators moving to other manufacturing jobs were somewhat able to compensate for their earning loss by about 23 % of a pre-MFA abolishment annual wage, but subsequent movement to the service sector has almost no effect on the cumulative earnings. Workers with elementary occupations (manufacturing labourers) fare even worse and experience an additional decline in earnings in subsequent jobs outside of their initial industry, amounting to one initial annual wage. These results are in line with Kambourov and Manovskii (2009) and provide worker-level evidence that highlight the importance of occupational tenure in trade-induced adjustment costs.

Due to the large number of occupation categories, I omitted the analyses for earnings and hours worked per year of employment. But insight into these within year of employment outcomes can still be gained by comparing the estimates for cumulative outcomes on employment, earnings and hours worked. The ratio of the coefficient estimates of cumulative employment to cumulative earnings indicates that earnings per year of employment decline substantially for machine operators and labourers, both overall and especially at subsequent service sector jobs. Results on the cumulative hours worked presented in Panel C also suggest that the main margin for the decline in earnings per year is the decline in the number of hours worked. Additional results presented in the online appendix also show that trade induced unemployment is especially concentrated among machine operators.

Results presented in column (b) of Panel A show that craft workers were the least negatively affected group at their exposed workplaces compared to other occupations. Piore and Sabel (1984) argues that low-wage competition forces restructuring of manufacturing towards more customized, craft oriented products while relocating mass production to low-wage countries. Utar (2014) documented restructuring in line with this idea in the Danish textile and clothing industry in response to the intensified competition from China. Craft workers have also been relatively good at compensating for the initial loss subsequently at service sector jobs. This group of workers includes craftsmen, like tailors, so it can be surmised that they had a

relatively better skill-match for jobs in the service sector.

While craft workers are the least affected occupational group at the initial workplace, clerks and other service workers suffered the smallest impact on their cumulative earnings and employment overall over the nine years. They were affected as badly as machine operators and assemblers at the initial workplace. Yet their abilities to recover subsequently were very good and workers in this group are observed to compensate for their initial loss similarly well in other T&C jobs, other manufacturing firms or in the service sector (Panel A of Table 8 in columns (c)-(e)). This is most probably because the occupation specific human capital of this group requires the least industry and employer specific knowledge, for example compared to being a machine operator in the T&C sector or being a production department manager, and they are more likely to retain their occupational skills across industries.[48]

Focusing on differences across occupations by controlling for other worker characteristics such as education levels, the trade shock is found to trigger movement to service jobs among workers across all occupations (column (e) of Panel B in Table 8). Further results presented in the online appendix show that the trade shock leads to increased likelihood of having a full-time employment in the service sector across all workers regardless of their initial occupation.[49] Results on cumulative employment and cumulative hours worked presented in column (e) indicate that managers and craft workers were relatively better at maintaining stable full-time employment in the service sector compared to, for example, machine operators.

Autor, Dorn, Hanson and Song (2014) show that low-wage workers tend to stay within manufacturing where they were repeatedly exposed to the import shock and identify being able to move out of manufacturing jobs as an important factor in determining the success of American workers' adjustment to the Chinese import shock. The results presented here show that even if workers move out of manufacturing jobs they continue to face significant adjustment costs. These results clearly establish the loss of industry and occupation specific

[48]Topel (1991) emphasizes the importance of firm-specific human capital and Neal (1995) finds industry-specific knowledge to be an important part of human capital. The results in this paper highlight that both firm and industry specific components of human capital are important aspects of trade adjustment, but the extent to which these two components play a role in workers' adjustment costs depends on the type of occupation.

[49]The results, presented in Table 4, show that in general workers move to full-time service sector jobs. To investigate whether a particular group of workers has a higher likelihood of moving to part-time jobs, the analysis presented in Table 4 is conducted separately depending on workers' education, initial occupation, and age. These results, presented in the online appendix, show that regardless of workers' education, initial occupation, or age, the jobs, that they move to in the service sector, are predominantly full-time.

human capital as an important adjustment friction and a key determinant of success and speed of recovery from the trade shock.

The importance of workers' occupation specific skill-match in subsequent service jobs to their recovery trajectory suggests that policies, such as ALMP, that could facilitate entry into a new sector, may not be enough to provide smooth adjustments for all workers.

5.3 Workers' Adjustment by Age

Industry and occupation specific human capital is likely to increase with workers' age and the ability to learn new skills to decrease. This would make older workers more vulnerable to potential loss of human capital caused by the trade induced broad sector switch. Examining the age aspect of human capital loss, Table 9 presents the analysis of workers' adjustment to the low-wage import shock separately for workers with different age groups.[50] Here the early career group consists of workers who in 1999 were between 22 and 35 years old. The mid career group is defined as workers who in 1999 were between 36 and 49 years old and finally the late career group consists of workers who in 1999 were between 50 and 56 years old.[51]

Results in Panel A of Table 9 show that the Chinese import shock causes cumulative earnings of late-career (50+) workers to decrease significantly by about one pre-MFA abolishment annual salary. For mid-career workers (36-49) the impact is around 60 % of a pre-MFA abolishment annual salary and the impact on the cumulative earnings of the younger cohort (22-35) is not found to be statistically significant. Overall effects contain differences in the ability to adjust to the initial shock by age cohorts. Results presented in column b of Panel A show that the impact on the cumulative earnings at the exposed workplace was strongest for mid career workers (1.4 initial annual salary), compared to early and late career workers (1 initial annual salary). The relatively strong initial shock on mid-career workers can be thought to be due to a combination of firms' lack of consideration regarding employees' tenure when laying off as they downsize, and the fact that mid-career workers should have been experiencing the most stable increase in the cumulative earnings/employment at the

[50] Full results including earnings, hours worked and hourly rate per year of employment are presented in the online appendix.

[51] The age group 'youth' who were between 17 and 22 years old in 1999 are not included in this analysis as the number of observations were too low to make a meaningful decomposition analysis.

initial workplace compared to other age groups, had there not been a negative shock.[52]

For all age groups, the likelihood of subsequent employment in the service sector increases due to the low-wage import shock (column e of Panel B in Table 9). For mid career workers the number of years spent in other jobs in the same sector as well as in other manufacturing jobs increases significantly as well, by about 1/4 and 1/5 of a year respectively. Both mid-aged and younger workers have similar likelihood of moving to the service sector. Yet younger workers have better earnings potentials in service sector jobs, and are able to compensate for 74 % (0.704/0.946) of their initial earnings losses in subsequent service sector jobs, while mid- and late career workers are not able to compensate significantly for their initial earnings losses.

Comparing the results in Panel B and C show that mid- and late career workers experience significant reductions in their cumulative hours worked and hours worked per year of employment. The significant reductions in hours worked are due to a combination of shortened tenure at the initial firms and also reductions in hours worked throughout the adjustment process. The reductions in hours worked per year of employment, on the other hand, are driven solely by reductions in hours worked per year of subsequent service employment. This shows that the pattern of job instability after the broad sector switch, shown to be characteristic of a difficult adjustment process, is more pronounced the older workers are, in line with the idea that younger workers are less sensitive to loss of human capital.

5.4 Trade-induced Skill Upgrading at the Worker Level

I show that college educated workers adjust successfully in the service sector and that the lack of the right skill set is an impediment to recovery for workers whose human capital is specific to the sector they left. These effects may induce workers to re-build human capital through education.

Workers can enroll in short-term or part-time education while being in the labor market or enroll in full-time education outside the labor market. If workers enroll in education in order to increase their suitability for their new work environment and to increase their

[52]In Denmark employment can be based on hourly wages which is the most typical form of employment for production workers or on monthly or annual salaries no matter the number of hours worked. The former is exempt from advance notification while employers are still required to give advance notifications for the latter.

job prospects, they can receive an education allowance from the UI. In Table 10 I analyze the effect of increased import competition with China on the number of years that a worker receives education allowance. The coefficient estimate in column (a) is positive and significant at the 0.1 % level, showing that trade causes workers to enroll in education for a substantial 0.6 year throughout the period. The decomposition analysis in columns (b)-(g) show that trade induces workers to further their education mostly after they have moved to the service sector. This indicates that, through education, workers seek to acquire skills that make them more suitable for jobs in their new work environment. Panels B, C, and D in Table 10 present the impact on the number of years with education allowance by workers' highest attained education and show that workers increasingly seek further education the less educated they are initially. Workers with at most high school education spend 0.7 years in education over the decade mostly while being in the service sector or unemployed. Workers with vocational education spend 0.5 years in education out of which half is while being in the service sector. Additional results in the online appendix also show that trade induces machine operators and manufacturing labourers to seek further education, but not clerks or craft workers (Table 18). These findings show that the incentive to rebuild human capital is strongest for those who have the least ability to retain their occupation specific human capital in the service sector.

While recent studies provide evidence of skill upgrading at the firm-level as a result of increased Chinese imports (Bloom, Draca, Van Reenen (2015) and Utar (2014)), whether the import from China can drive skill-upgrading at the individual level is an important yet unanswered question. These findings point to a new and interesting channel through which imports from low-wage countries can shape the structure of advanced economies, as not only firms but also individuals respond by upgrading their skills.

Table 10: Trade-induced Skill Upgrading: Worker Level Evidence

	(a) Overall Effect	(b) Initial Firm	(c) other Manuf. Jobs	(d) Service Sector	(e) Self-Employed	(f) Unemployed	(g) Outside of Labor Market
Number of Years with Education Allowance							
A. All Workers							
AffW ($\widehat{\beta}_1$)	0.616***	-0.066**	0.105*	0.351***	0.104**	0.009	0.102*
	(0.139)	(0.025)	(0.041)	(0.068)	(0.034)	(0.010)	(0.045)
B. College Educated Workers							
AffW ($\widehat{\beta}_1$)	0.299	-0.033	0.092	0.243	-0.014	0.023	-0.025
	(0.393)	(0.067)	(0.113)	(0.186)	(0.108)	(0.044)	(0.112)
C. Workers with Vocational Education							
AffW ($\widehat{\beta}_1$)	0.527*	-0.059	0.155*	0.254*	0.071	0.001	0.094
	(0.211)	(0.040)	(0.065)	(0.101)	(0.048)	(0.015)	(0.072)
D. Workers with at most a High School Diploma							
AffW ($\widehat{\beta}_1$)	0.720***	-0.076*	0.080	0.423***	0.144**	0.003	0.130
	(0.205)	(0.036)	(0.062)	(0.103)	(0.049)	(0.013)	(0.068)

Notes: The numbers of observations across all columns in panel A, B, C, and D are 10521, 1200, 3680, and 5392 respectively. All regressions include a constant and the full set of controls, Z_i^W and Z_i^F. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 5 %, 1% and 0.1% levels respectively. Data Source: Statistics Denmark.

Workers may also enroll in full-time education and leave the labor market for the time being. To be able to distinguish the impact of trade on workers' exits for education purposes from other reasons, I decompose the calendar years spent outside the labor market further into three different reasons: workers going into early retirement, workers opting for further education and other reasons (disability, family, maternity, etc..). These results are reported in column (a) of Table 11. Although only weakly significant, the coefficient estimate for the number of years spent outside the labor market for education purposes suggests that the trade shock causes workers to exit the labor market to attain further education. Sampling the workers according to their highest attained education, I conducted the analysis among workers with the least education, namely workers with at most a high school diploma. These results are presented in column (b) of Table 11. The coefficient estimate for the number of years spent outside of the labor market for education purposes is significant at the 0.1 percent level for workers with at most high school diploma. The results confirm that the trade shock leads workers to attain further education by especially pushing the least educated to go for school. Looking at workers' labor market exit for education from the perspective of their occupation, results show that trade induces workers whose occupation specific human capital

is less relevant to the service sector (machine operators and manufacturing labourers) to leave for education, while workers with similar education level whose occupation is more relevant to the service sector (clerks and craft workers) do not (Table 19 in the online appendix).

Table 11: Exit for *Good*?

	(a) **All Workers**	(b) **Workers with at most a high school diploma**
No. of Years Outside for Early Retirement		
AffW ($\widehat{\beta_1}$)	0.052	0.017
	(0.028)	(0.044)
No. of Years Outside for Education		
AffW ($\widehat{\beta_1}$)	0.021*	0.052***
	(0.009)	(0.015)
No. of Years Outside for other reasons		
AffW ($\widehat{\beta_1}$)	-0.019	-0.050
	(0.021)	(0.032)

Notes: Dependent variables vary across rows and are listed in the table. The number of observations in columns (a) and (b) are 10521 and 5392 respectively across all panels. All regressions include a constant and the full set of controls, Z_i^W and Z_i^F. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 5 %, 1% and 0.1% levels respectively. Data Source: Statistics Denmark.

6 Income Recovery via Transfers?

The trade shock increases workers' likelihood of having employment in the service sector compared to other observationally similar T&C workers. But on average exposed workers have lower earnings and working hours in the service sector. Together with the results on part-time jobs and unemployment, this indicates that workers experience frequent disruptions after moving to the service sector jobs.

ALMP in Denmark may have played a role in allowing workers to move from the shrinking sector to the growing service sector relatively quickly. However, while ALMP can help workers find and take jobs relatively quickly, they may not be effective in making workers maintain *stable* employment. When workers move to service sector jobs they are still eligible for unemployment benefit whenever these jobs are terminated involuntarily. For workers for whom this happens initial earnings losses are partially recovered via 'benefits and transfers' while their primary attachment to the labor market is now in the service sector.

To analyze this possibility a cumulative personal income variable is constructed for each worker (measured in initial annual personal income). In addition to labor earnings and self-employment income, the personal income variable includes unemployment benefit, pension income and welfare transfers. The overall effect of the import shock on personal income is estimated using equation 2 and it is decomposed over the mutually exclusive labor market positions of workers.

Panel A of Table 12 presents these results. Like the results on wages, affected workers' loss at the initial employer amounts to close to 110 % of a pre-MFA abolishment annual income. Unlike the results on wages, personal income results reveal that workers significantly compensate for their initial earnings losses while their primary attachment to the labor market is in the service sector. Comparing the estimate in Panel C of Table 5, 0.702^{***}, with the estimate in column (d) of Panel A in Table 12, 0.729^{***}, shows that as opposed to recovery in earnings, recovery in income happens to the same extent as recovery in employment in the service sector. That is, workers are getting other compensation beside their labor earnings after moving to the service sector.

Older workers may use the possibility of receiving pension benefits while having employment in the service sector. Panel B of Table 12 shows the effect of trade on cumulative pension income. Trade does not drive recovery via pension income on average. Panel C presents the effect of the import shock on the sickness benefit that workers receive if they cannot work due to health reasons for a temporary period of time.[53] Trade exposed workers are not found to disproportionately receive sickness benefits while in the service sector, suggesting that these benefits are not mis-used.[54] Panel D of Table 12 presents the effect of trade on the cumulative unemployment benefits. Workers can obtain several benefits from the UI, the cumulative unemployment variable (measured in initial personal income) in Panel D only includes the unemployment benefits. Both the overall effect of trade on the UI benefits and the effect at the service sector are statistically significant at the 0.1 percent level, confirming that moving to the service sector does not ensure smooth earnings recovery and that the UI is an important part of the income recovery when manufacturing workers move to the service sector due to the trade shock.

[53] In Denmark the sickness benefit can either be received from municipalities or from employers depending on workers' type of contracts. The sickness benefits in Panel C of Table 12 include both of the sources. The results are very similar if the analysis conducted separately depending on the source.

[54] Note that the sickness benefits are not the same as disability benefits. Disability benefits are long-term and the recipients are considered to be outside of the labor market.

Panel E of Table 12 presents the effect of trade on the cumulative education allowance from the UI. The results confirm that trade induces further education overall and that the education allowance, although small in magnitude, is a significant part of the income recovery after workers move to the service sector. Panel F shows the effect of trade on other benefits from the UI that are not related to training or education. These results show that, in addition to unemployment benefit itself, additional benefits from the UI are significant sources of income recovery for trade exposed workers.

The results show that the period after the trade shock, at least for some workers, is marked by job instability even after moving to the service sector, and the income recovery for these workers is partly dependent on government transfers.

7 Concluding Remarks

Increasing trade with China and other low-wage countries and its effect on advanced country manufacturing industries and workers is a prominent topic of current public debate. It plays a part in the ongoing waning of manufacturing employment in advanced economies, and with it an entire class of stable, middle-income jobs. A question of policy relevance is also whether economic and social policies can make a difference in the distributional consequences of globalization and cushion the impact to the most exposed groups of people. It has been argued that the social systems typical of northern Europe may perform better than the US counterpart at easing the burden on the most exposed to global competition.

Contributing to the debate, in this paper I analyze the impact of a Chinese import shock on workers' earnings and employment trajectories in a European country with a generous social net and active labor market policies in an experiment that directly measures the causal effects of a trade policy change impacting a classic manufacturing industry. By directly comparing say, a clerk to a clerk, or a machine operator to a machine operator that are all initially employed in the same industry, but differ only by exposure to the trade shock, this study disentangles the effects of the trade shock from potentially important technology and demand factors. By using longitudinal employee employer matched data that follows individuals from job to job, sector to sector but also in and out of education, unemployment, or retirement, this study provides a true-to-life documentation of manufacturing workers' adjustment to the trade shock over the decade that follows.

The results show that the abolishment of import quotas for China in conjunction with China's accession to the WTO has substantial negative impact on Danish workers' earnings and employment trajectories over the following decade. The impact on earnings amounts to 70 % of an initial annual earnings over nine years. A number of features of workers' adjustment to trade shocks are documented which shed light into the nature of adjustment frictions. The import shock negatively affects workers in firms exposed to increased competition in the short term regardless of age, education and occupation. The extent of the negative impact and the ability and time needed for workers to recover from it, on the other hand, are very much dependent on these characteristics of workers, that reflect their investment in human capital. These results point to the importance of short-to-long term adjustment costs of globalization and inform policy makers about the most vulnerable.

The service sector is the main absorber of displaced workers and the ability of workers to recover from the negative impact of the quota removal appears to depend on how well suited they are for jobs in the service sector. College educated workers, clerks and service workers and younger cohorts are found have the best ability to recover from the initial negative shock. Contrary to what studies so far suggested, these results show that trade-induced adjustment problems do not end once workers find full-time jobs in the growing sectors and bring into light a new facet of the nature of these frictions. The adjustment problems persist for workers who would lose a substantial part of their human capital in their new environment. By showing that the trade shock increases incentives to acquire further education, this paper also provides a first worker-level evidence on skill acquisition in response to increased competition from China and opens up an intriguing topic for further study.

I find that shorter employment spells at the initial firm and unstable subsequent employment disrupted with frequent unemployment are the main channels through which workers are affected from the trade shock, rather than a decline in their initial and/or subsequent hourly wages or inability to move to growing sectors. The removal of import quotas on China increases the likelihood of unemployment, but it does not appear to lead to self-employment or drive workers out of the labor market altogether. Active labor market policies combined with a relatively well functioning unemployment insurance system may be one reason behind mobile Danish workers, who do not easily leave the labor market. These results provide new information on the role of institutional differences for shaping the adjustment mechanism. By showing substantial adjustment frictions that workers experience even after moving to

full-time service sector jobs, the results also suggest that effective ALMPs may ensure faster movement towards growing sectors, but this itself does not provide for a smooth adjustment experience as workers still face challenges in adapting to the new environment.

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Table 2: Cumulative Impact of MFA Quota Abolishment over 2002-2010

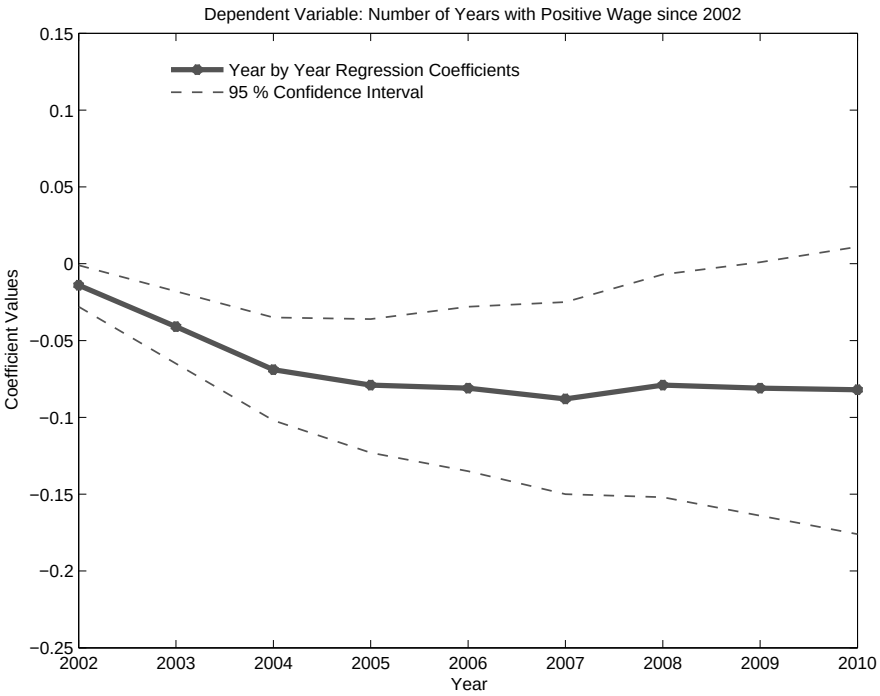
Workers with primary employment in the T&C sector in 1999				
	(a)	(b)	(c)	(d)
A. Cumulative Earnings 2002-2010 (in multiples of initial annual wage)				
AffW ($\widehat{\beta}_1$)	-0.628***	-0.629***	-0.656***	-0.700***
	(0.186)	(0.181)	(0.179)	(0.180)
Demographic Controls	no	yes	yes	yes
Occupation Types	no	no	yes	yes
Education Levels	no	no	yes	yes
Labor Market History	no	no	yes	yes
Initial Hourly Wage	no	no	yes	yes
Union Membership	no	no	yes	yes
UI Membership	no	no	yes	yes
Initial Workplace Controls	no	no	no	yes
B. Cumulative Employment 2002-2010				
AffW ($\widehat{\beta}_1$)	-0.023	0.056	-0.091	-0.082
	(0.051)	(0.049)	(0.048)	(0.048)
Demographic Controls	no	yes	yes	yes
Occupation Types	no	no	yes	yes
Education Levels	no	no	yes	yes
Labor Market History	no	no	yes	yes
Union Membership	no	no	yes	yes
UI Membership	no	no	yes	yes
Initial Hourly Wage	no	no	yes	yes
Initial Workplace Controls	no	no	no	yes
C. Cumulative Hours Worked 2002-2010 (in multiples of initial annual hours worked)				
AffW ($\widehat{\beta}_1$)	-0.495***	-0.495***	-0.519***	-0.553***
	(0.116)	(0.116)	(0.114)	(0.115)
Demographic Controls	no	yes	yes	yes
Occupation Types	no	no	yes	yes
Education Levels	no	no	yes	yes
Labor Market History	no	no	yes	yes
Initial Hourly Wage	no	no	yes	yes
Union Membership	no	no	yes	yes
UI Membership	no	no	yes	yes
Initial Workplace Controls	no	no	no	yes

Notes: In all columns across Panel A, B, and C the number of observations are 10521. A constant is included but not reported. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 5 %, 1% and 0.1% levels respectively. Demographic controls are age, gender dummy, and immigration status dummy. Occupation types are indicator variables whether an individual was employed in 1999 having a high-level, intermediate-level, base level, or auxiliary/unspecified occupation (outside category). Education levels are dummy variables indicating whether an individual has at most high school degree, vocational education or college and above degree in 1999. Labor Market History variables are unemployment history and experience variables. The unemployment history of the worker is the cumulative sum of the percentage of working time spent as unemployed within each year between 1980-1999. Experience is the number of years person was in the labor market between 1980-1999. Initial wage is the logarithm of the average hourly wage of an individual (from his/her primary occupation in T&C) in 1999 and 2000. Union membership is a dummy variable indicating if the individual is a member of a labor union. UI membership is a dummy variable indicating if the individual is a member of the (voluntary) Unemployment Insurance Fund. Initial workplace controls are the logarithm of the average hourly wage in the workplace in 1999, and the separation rate in 1999 (percentage of employees that left the workplace since the previous year). Data Source: Statistics Denmark.

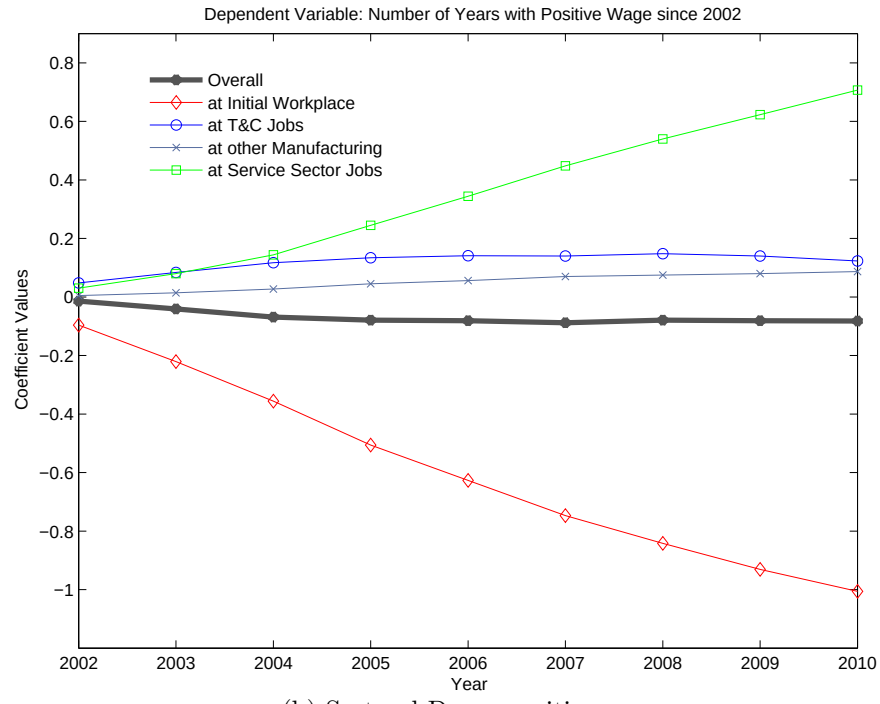
Table 3: Workers' Recovery across Jobs within and between Sectors

	(a) Overall Effect	(b) Initial Firm	(c) other T&C	(d) other Manuf	(e) Service	(f) Other
	A. Cumulative Earnings 2002-2010 (in initial annual wage)					
AffW ($\widehat{\beta}_1$)	-0.700***	-1.105***	0.048	-0.057	0.425*	-0.011
	(0.180)	(0.070)	(0.063)	(0.094)	(0.167)	(0.044)
	B. Cumulative Employment 2002-2010					
AffW ($\widehat{\beta}_1$)	-0.082	-1.006***	0.123**	0.087	0.707***	0.008
	(0.048)	(0.059)	(0.041)	(0.044)	(0.059)	(0.020)
	C. Earnings per year of Employment 2002-2010 (in initial annual wage)					
AffW ($\widehat{\beta}_1$)	-0.116***	-0.020*	-0.050	-0.087	-0.109**	0.021
	(0.024)	(0.009)	(0.033)	(0.066)	(0.038)	(0.091)
	D. Cumulative Hours Worked 2002-2010 (in initial annual hours worked)					
AffW ($\widehat{\beta}_1$)	-0.553***	-1.046***	0.087	-0.018	0.440***	-0.015
	(0.115)	(0.063)	(0.051)	(0.070)	(0.106)	(0.030)
	E. Hours Worked per year of Employment 2002-2010 (in initial annual hours)					
AffW ($\widehat{\beta}_1$)	-0.084***	-0.011	-0.039	-0.068	-0.096***	-0.037
	(0.015)	(0.006)	(0.021)	(0.038)	(0.024)	(0.064)
	F. Hourly Rate per year of Employment 2002-2010 (in initial hourly rate)					
AffW ($\widehat{\beta}_1$)	-0.007	-0.013*	0.014	-0.012	0.012	0.021
	(0.007)	(0.006)	(0.011)	(0.015)	(0.011)	(0.025)

Notes: In Panels A, B and D, the number of observations are 10521. In Panels C, E, and F the number of observations are decreasing from 10101, 10042, and 10042 respectively in columns a through f. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 5 %, 1% and 0.1% levels respectively. All regressions include the full set of controls. A constant is included but not reported. The full set of controls are demographic controls (age, gender, immigration status), occupation types, education levels, experience, unemployment history, initial hourly wage, union membership, UI membership, and the initial workplace controls as described in tablenotes of Table 2. Data Source: Statistics Denmark.



(a) Overall Impact



(b) Sectoral Decomposition

Figure 2: Year by Year Impact of Trade on the Cumulative Employment

All regressions include a constant and the full set of controls, Z_i^W and Z_i^F.

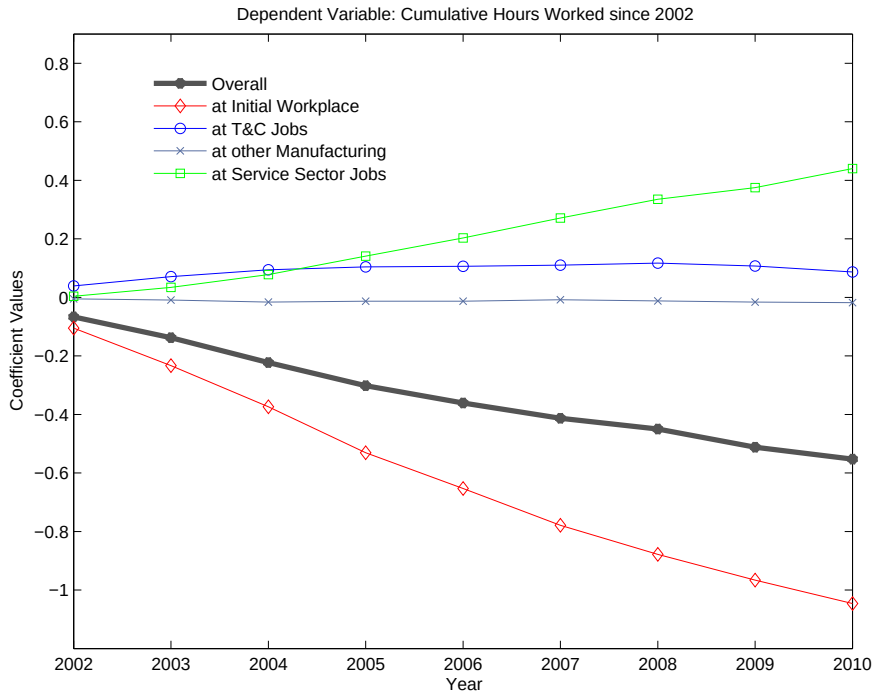


Figure 3: Year by Year Impact of Trade on the Cumulative Hours Worked

All regressions include a constant and the full set of controls, Z_i^W and Z_i^F.

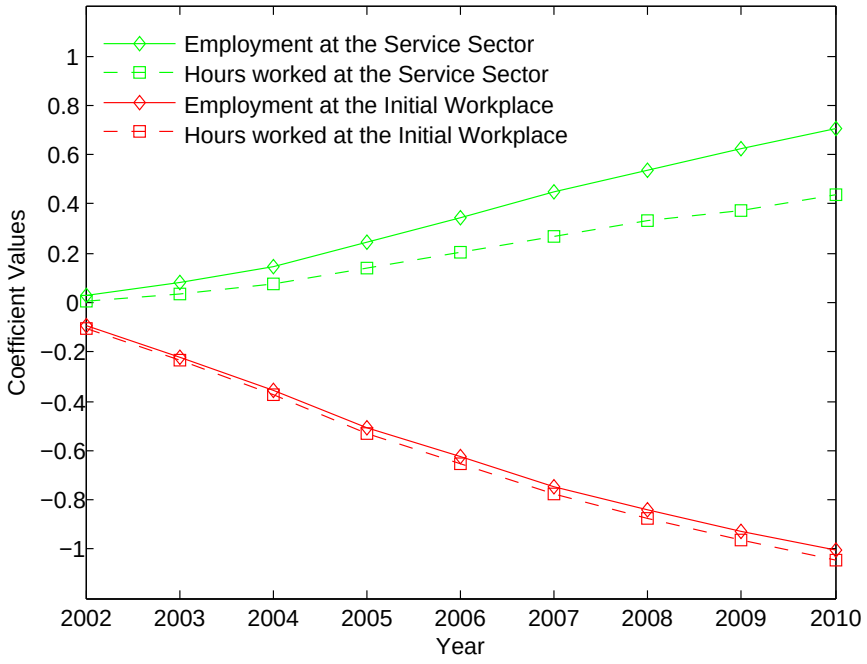


Figure 4: Recovery in Employment versus Hours Worked

All regressions include a constant and the full set of controls, Z_i^W and Z_i^F.

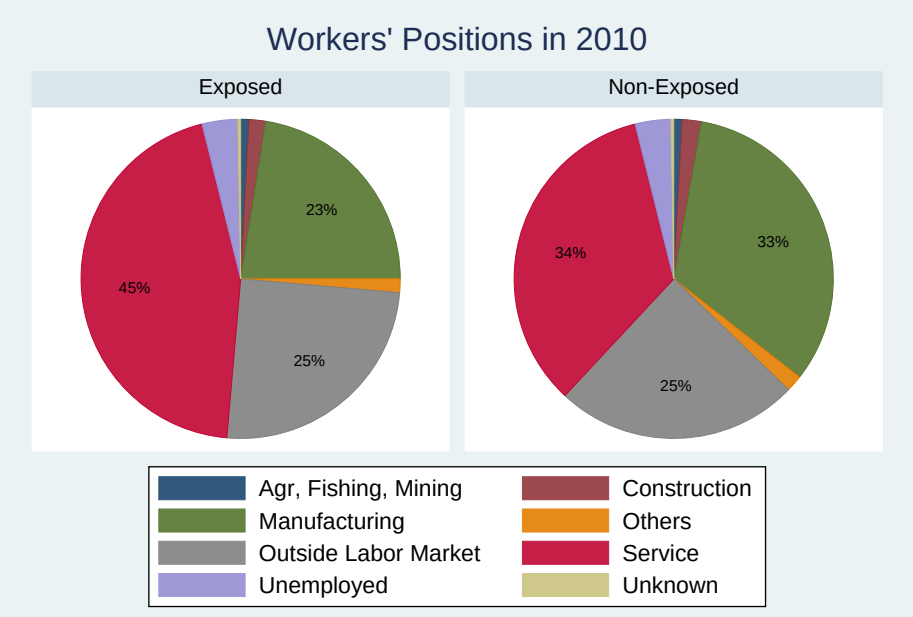


Figure 5: Labor Market Positions of the Workers in 2010 By Trade Exposure (Source: Statistics Denmark)

Table 6: Workers' Adjustment by Education I, 2002-2010

	(a) All	(b) Initial Firm	(c) other T&C	(d) other Manuf	(e) Service	(f) Other
	A. Cumulative Earnings 2002-2010 (in initial annual wage)					
College Educated Workers						
AffW ($\widehat{\beta}_1$)	0.379	-1.106***	0.189	-0.291	1.522**	0.064
	(0.523)	(0.234)	(0.263)	(0.265)	(0.469)	(0.052)
Workers with Vocational Schooling						
AffW ($\widehat{\beta}_1$)	-0.655**	-1.165***	0.121	0.051	0.364	-0.027
	(0.243)	(0.117)	(0.103)	(0.121)	(0.218)	(0.085)
Workers with at most a High School Degree						
AffW ($\widehat{\beta}_1$)	-1.033***	-1.022***	-0.048	-0.114	0.166	-0.015
	(0.300)	(0.094)	(0.087)	(0.164)	(0.279)	(0.062)
	B. Cumulative Employment 2002-2010					
College Educated Workers						
AffW ($\widehat{\beta}_1$)	0.222	-0.946***	0.363**	-0.364*	1.111***	0.058
	(0.124)	(0.188)	(0.127)	(0.141)	(0.178)	(0.049)
Workers with Vocational Schooling						
AffW ($\widehat{\beta}_1$)	-0.207**	-1.080***	0.213**	0.074	0.604***	-0.017
	(0.078)	(0.102)	(0.070)	(0.073)	(0.100)	(0.036)
Workers with at most a High School Degree						
AffW ($\widehat{\beta}_1$)	-0.058	-0.938***	0.010	0.182**	0.665***	0.022
	(0.070)	(0.080)	(0.057)	(0.063)	(0.082)	(0.028)
	C. Earnings per year of Employment 2002-2010 (in initial annual wage)					
College Educated Workers						
AffW ($\widehat{\beta}_1$)	-0.007	-0.021	-0.080	0.077	-0.031	-0.138
	(0.061)	(0.031)	(0.113)	(0.144)	(0.093)	(0.200)
Workers with Vocational Schooling						
AffW ($\widehat{\beta}_1$)	-0.080**	-0.009	-0.068	-0.024	-0.099*	0.074
	(0.030)	(0.012)	(0.060)	(0.069)	(0.050)	(0.181)
Workers with at most a High School Degree						
AffW ($\widehat{\beta}_1$)	-0.174***	-0.028	-0.037	-0.170	-0.148*	-0.029
	(0.042)	(0.015)	(0.044)	(0.112)	(0.065)	(0.116)

Notes: In Panels A and B, the number of observations are 1200, 3680 and 5392 respectively for college, vocational and high school rows. In Panel C, the number of observations are decreasing from 1173 (college), 3565 (vocational) and 5135 (high school) respectively. All regressions include a constant and the full set of controls, Z_i^W and Z_i^F except the controls for education levels as the regressions are ran within education levels samples. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 5 %, 1% and 0.1% levels respectively. Data Source: Statistics Denmark.

Table 7: Workers' Adjustment by Education II, 2002-2010

	(a) All	(b) Initial Firm	(c) other T&C	(d) other Manuf	(e) Service	(f) Other
	A. Cumulative Hours Worked 2002-2010 (in initial annual hours worked)					
College Educated Workers						
AffW ($\widehat{\beta}_1$)	0.090	-1.005***	0.306	-0.265	0.993**	0.062
	(0.359)	(0.202)	(0.201)	(0.209)	(0.324)	(0.049)
Workers with Vocational Schooling						
AffW ($\widehat{\beta}_1$)	-0.610***	-1.127***	0.149	0.064	0.351*	-0.047
	(0.177)	(0.108)	(0.087)	(0.098)	(0.168)	(0.063)
Workers with at most a High School Degree						
AffW ($\widehat{\beta}_1$)	-0.611***	-0.961***	-0.004	-0.030	0.391*	-0.006
	(0.171)	(0.086)	(0.068)	(0.111)	(0.154)	(0.038)
	B. Hours Worked per year of Employment 2002-2010 (in initial annual hours)					
College Educated Workers						
AffW ($\widehat{\beta}_1$)	-0.019	-0.023	-0.089	0.062	-0.060	0.068
	(0.043)	(0.020)	(0.087)	(0.116)	(0.067)	(0.160)
Workers with Vocational Schooling						
AffW ($\widehat{\beta}_1$)	-0.071**	-0.010	-0.075*	-0.017	-0.094*	-0.017
	(0.023)	(0.009)	(0.034)	(0.048)	(0.038)	(0.122)
Workers with at most a High School Degree						
AffW ($\widehat{\beta}_1$)	-0.099***	-0.007	-0.012	-0.112	-0.098**	-0.085
	(0.023)	(0.010)	(0.029)	(0.060)	(0.036)	(0.081)
	C. Hourly Rate per year of Employment 2002-2010 (in initial hourly rate)					
College Educated Workers						
AffW ($\widehat{\beta}_1$)	0.020	0.033	0.082*	-0.033	0.036	0.034
	(0.017)	(0.020)	(0.036)	(0.044)	(0.026)	(0.088)
Workers with Vocational Schooling						
AffW ($\widehat{\beta}_1$)	-0.002	-0.008	0.017	-0.010	0.014	0.013
	(0.008)	(0.009)	(0.017)	(0.018)	(0.014)	(0.035)
Workers with at most a High School Degree						
AffW ($\widehat{\beta}_1$)	-0.025*	-0.027**	0.001	-0.039	-0.008	0.014
	(0.012)	(0.008)	(0.016)	(0.028)	(0.018)	(0.039)

Notes: In Panel A the number of observations are 1200, 3680 and 5392 respectively for college, vocational and high school rows. In Panels B and C the number of observations are decreasing from 1169(college), 3552 (vocational), and 5095 (high school), respectively. All regressions include a constant and the full set of controls, Z_i^W and Z_i^F except the controls for education levels as the regressions are ran within education levels samples. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 5 %, 1% and 0.1% levels respectively. Data Source: Statistics Denmark.

Table 8: Workers' Adjustment by Initial Occupation , 2002-2010

	(a) All	(b) Initial Firm	(c) other T&C	(d) other Manuf	(e) Service	(f) Other
	A. Cumulative Earnings 2002-2010 (in initial annual wage)					
Managers						
AffW ($\widehat{\beta}_1$)	-0.447	-1.139***	0.112	-0.344	0.848*	0.076
	(0.428)	(0.329)	(0.260)	(0.285)	(0.339)	(0.073)
Professionals and Techs						
AffW ($\widehat{\beta}_1$)	-0.417	-0.919***	0.399*	-0.578**	0.621	0.061
	(0.422)	(0.214)	(0.188)	(0.200)	(0.410)	(0.053)
Clerks and Service Workers						
AffW ($\widehat{\beta}_1$)	0.171	-1.149***	0.372*	0.315	0.680	-0.047
	(0.613)	(0.220)	(0.146)	(0.211)	(0.619)	(0.129)
Craft Workers						
AffW ($\widehat{\beta}_1$)	-0.282	-0.765**	-0.131	0.058	0.618*	-0.062
	(0.363)	(0.270)	(0.175)	(0.260)	(0.279)	(0.110)
Operators and Assemblers						
AffW ($\widehat{\beta}_1$)	-1.056***	-1.159***	-0.155	0.228	0.016	0.013
	(0.221)	(0.100)	(0.091)	(0.131)	(0.196)	(0.060)
Manufacturing Labourers						
AffW ($\widehat{\beta}_1$)	-2.034*	-1.459***	0.478*	-0.386	-0.693	0.025
	(0.813)	(0.278)	(0.225)	(0.392)	(0.773)	(0.259)
	B. Cumulative Employment 2002-2010					
Managers						
AffW ($\widehat{\beta}_1$)	-0.428	-1.114***	0.006	-0.164	0.809**	0.035
	(0.226)	(0.295)	(0.203)	(0.171)	(0.245)	(0.075)
Professionals and Techs						
AffW ($\widehat{\beta}_1$)	0.064	-0.836***	0.448***	-0.452***	0.848***	0.056
	(0.116)	(0.175)	(0.116)	(0.115)	(0.171)	(0.038)
Clerks and Service Workers						
AffW ($\widehat{\beta}_1$)	0.174	-0.864***	0.298**	0.171	0.567**	0.002
	(0.108)	(0.173)	(0.101)	(0.106)	(0.174)	(0.049)

Notes: The number of observations are 538 (managers), 1474 (professionals and technicians), 1366 (clerks and other service workers), 894 (craftsmen), 4553 (machine operators and assemblers), and 906 (elementary occupations) rows. All regressions include a constant and the full set of controls, Z_i^W and Z_i^F except the control for occupation categories as the regressions are run within occupation samples. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 5 %, 1% and 0.1% levels respectively. Data Source: Statistics Denmark.

Table 8 (contd.): Workers' Adjustment by Initial Occupation, 2002-2010

	(a) All	(b) Initial Firm	(c) other T&C	(d) other Manuf	(e) Service	(f) Other
	B. Cumulative Employment 2002-2010					
Craft Workers						
AffW ($\widehat{\beta}_1$)	0.096	-0.816***	0.051	0.217	0.667***	-0.023
	(0.172)	(0.230)	(0.140)	(0.177)	(0.180)	(0.084)
Operators and Assemblers						
AffW ($\widehat{\beta}_1$)	-0.194*	-1.087***	-0.038	0.342***	0.536***	0.053
	(0.079)	(0.088)	(0.064)	(0.075)	(0.088)	(0.032)
Manufacturing Labourers						
AffW ($\widehat{\beta}_1$)	-0.116	-1.225***	0.461**	-0.021	0.667**	0.001
	(0.164)	(0.195)	(0.147)	(0.142)	(0.204)	(0.079)
	C. Cumulative Hours Worked 2002-2010 (in initial annual hours worked)					
Managers						
AffW ($\widehat{\beta}_1$)	-0.304	-1.168***	0.081	-0.130	0.854**	0.060
	(0.355)	(0.304)	(0.259)	(0.197)	(0.327)	(0.080)
Professionals and Techs						
AffW ($\widehat{\beta}_1$)	-0.487	-0.802***	0.427**	-0.536***	0.379	0.045
	(0.310)	(0.184)	(0.158)	(0.157)	(0.309)	(0.046)
Clerks and Service Workers						
AffW ($\widehat{\beta}_1$)	0.002	-0.992***	0.353**	0.216	0.494	-0.068
	(0.357)	(0.189)	(0.124)	(0.159)	(0.363)	(0.111)
Craft Workers						
AffW ($\widehat{\beta}_1$)	-0.271	-0.819***	-0.113	0.088	0.623**	-0.051
	(0.293)	(0.246)	(0.169)	(0.222)	(0.229)	(0.092)
Operators and Assemblers						
AffW ($\widehat{\beta}_1$)	-0.778***	-1.110***	-0.099	0.200	0.191	0.040
	(0.171)	(0.094)	(0.080)	(0.123)	(0.143)	(0.043)
Manufacturing Labourers						
AffW ($\widehat{\beta}_1$)	-1.012*	-1.295***	0.437*	-0.379	0.208	0.017
	(0.468)	(0.212)	(0.171)	(0.299)	(0.418)	(0.113)

Notes: The number of observations are 538 (managers), 1474 (professionals and technicians), 1366 (clerks and other service workers), 894 (craftsmen), 4553 (machine operators and assemblers), and 906 (manufacturing labourers) rows. All regressions include a constant and the full set of controls, Z_i^W and Z_i^F except the controls for occupation categories as the regressions are run within occupation samples. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 5 %, 1% and 0.1% levels respectively. Data Source: Statistics Denmark.

Table 9: Workers' Adjustment By Age, 2002-2010

	(a) All	(b) Initial Firm	(c) other T&C	(d) other Manuf	(e) Service
	A. Cumulative Earnings 2002-2010 (in initial annual wage)				
Early Career					
AffW ($\widehat{\beta}_1$)	-0.380	-0.946***	0.060	-0.140	0.704*
	(0.334)	(0.122)	(0.122)	(0.189)	(0.309)
Mid Career					
AffW ($\widehat{\beta}_1$)	-0.576**	-1.358***	0.174	0.176	0.354
	(0.206)	(0.116)	(0.091)	(0.119)	(0.191)
Late Career					
AffW ($\widehat{\beta}_1$)	-1.080***	-1.020***	-0.145	0.027	0.132
	(0.212)	(0.133)	(0.115)	(0.095)	(0.134)
	B. Cumulative Employment 2002-2010				
Early Career					
AffW ($\widehat{\beta}_1$)	0.045	-0.821***	0.109	0.014	0.769***
	(0.069)	(0.096)	(0.069)	(0.082)	(0.104)
Mid Career					
AffW ($\widehat{\beta}_1$)	-0.059	-1.273***	0.233**	0.208**	0.742***
	(0.068)	(0.102)	(0.073)	(0.074)	(0.095)
Late Career					
AffW ($\widehat{\beta}_1$)	-0.406**	-0.950***	0.022	0.065	0.433***
	(0.130)	(0.125)	(0.077)	(0.067)	(0.103)
	C. Cumulative Hours Worked 2002-2010 (in initial annual hours worked)				
Early Career					
AffW ($\widehat{\beta}_1$)	-0.203	-0.896***	0.087	-0.061	0.712***
	(0.203)	(0.104)	(0.094)	(0.123)	(0.198)
Mid Career					
AffW ($\widehat{\beta}_1$)	-0.499**	-1.316***	0.191*	0.146	0.432**
	(0.157)	(0.108)	(0.087)	(0.106)	(0.149)
Late Career					
AffW ($\widehat{\beta}_1$)	-0.852***	-0.921***	-0.047	0.007	0.179
	(0.186)	(0.128)	(0.085)	(0.091)	(0.132)

Notes: In Panels A, B, and C the number of observations are 3869, 4077 and 2120 respectively for early, mid and late career age groups. The early career group is defined as workers who in 1999 were between 22 and 35 years old. The mid career group is defined as workers who in 1999 were between 36 and 49 years old and finally the late career group consists of workers who in 1999 were between 50 and 56 years old. All regressions include a constant and the full set of controls, Z_i^W and Z_i^F except the age variable. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 5 %, 1% and 0.1% levels respectively. Data Source: Statistics Denmark.

Table 12: Recovery Via Transfers?

	(a) Overall Effect	(b) Initial Firm	(c) other Manufacturing Jobs	(d) Service Sector	(e) Self-Employed	(f) Unemployed	(g) Outside of Labor Market
	A. Cumulative Personal Income 2002-2010 (in initial annual personal income)						
AffW ($\widehat{\beta}_1$)	-0.112	-1.071***	0.203**	0.729***	-0.009	0.045**	0.004
	(0.082)	(0.066)	(0.073)	(0.097)	(0.018)	(0.016)	(0.034)
	B. Cumulative Pension Income 2002-2010 (in initial annual personal income)						
AffW ($\widehat{\beta}_1$)	0.046	-0.006	0.001	0.014*	-0.000	-0.002	0.038
	(0.024)	(0.003)	(0.003)	(0.006)	(0.000)	(0.002)	(0.023)
	C. Cumulative Sickness Benefits 2002-2010 (in initial annual personal income)						
AffW ($\widehat{\beta}_1$)	-0.016	-0.008***	0.000	0.002	-0.000	0.002*	-0.011
	(0.009)	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)	(0.006)
	D. Cumulative Unemployment Benefit 2002-2010 (in initial annual personal income)						
AffW ($\widehat{\beta}_1$)	0.042***	-0.013***	0.003	0.019***	0.023**	0.000	0.008*
	(0.013)	(0.002)	(0.003)	(0.005)	(0.007)	(0.001)	(0.004)
	E. Cumulative Education Allowance 2002-2010 (in initial annual personal income)						
AffW ($\widehat{\beta}_1$)	0.011**	-0.000*	0.001	0.005**	0.001	0.000	0.004
	(0.003)	(0.000)	(0.001)	(0.002)	(0.001)	(0.000)	(0.002)
	F. Cumulative Other Benefits from UI Fund 2002-2010 (in initial annual personal income)						
AffW ($\widehat{\beta}_1$)	0.014***	-0.001***	0.002***	0.006***	0.003***	0.000	0.003**
	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)

Notes: The number of observations in all panels and columns is 10520. All regressions include a constant and the full set of controls, Z_i^W and Z_i^F. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 5 %, 1% and 0.1% levels respectively. Data Source: Statistics Denmark.

Appendix A

Table A-1: Worker Characteristics in 1999: Demographics, Occupation, Education, Wage, Workplace

Workers with primary employment in T&C in 1999						
Panel A: Demographics						
	Age	Female	Immigrant	Experience	Union Membership	UI Membership
Mean	38.683	0.568	0.066	13.955	0.764	0.872
Std	10.523	0.495	0.249	6.192	0.425	0.334
N	11589	11589	11589	11589	11589	11589
Panel B: Occupation and Education						
	High-Level Occupations	Mid-Level Occupations	Base-Level Occupations	College Education	Vocational Education	High School or Less
Mean	0.082	0.123	0.628	0.113	0.346	0.516
Std	0.275	0.329	0.483	0.316	0.476	0.500
N	11589	11589	11589	11589	11589	11589
Panel C: Wage and Workplace						
	Log Hourly Wage	Log Annual Salary	Log Avg. Hourly Wage at the Firm	Negative Trend at the Firm	Positive Trend at the Firm	Separation Rate at the Firm
Mean	4.968	12.025	5.030	0.438	0.236	27.352
Std	0.359	0.800	0.181	0.496	0.425	22.163
N	10833	11327	11405	11328	11328	11534

Variables Female, Immigrant, Union Membership, UI Membership, High-Level, Mid-Level and Base-level Occupations, College, Vocational and High School or Less are worker-level indicator variables. Experience is the number of years that a worker has been in the labor market. The variables High-Level, Mid-Level and Base-level Occupations take value 1 if a worker's primary employment is classified under the respective occupation category. The outside category includes workers with auxiliary or unspecified occupations. Variables College, Vocational and High School or Less take value 1 if a worker's highest educational attainment is classified under the respective category. The outside category includes workers who have unspecified educational attainment. Log Hourly Wage is the logarithm of hourly wage of workers in their primary employment. Log Annual Salary is the logarithm of the annual salary of workers in their primary employment. Log Average Hourly Wage is the logarithm of average hourly wages paid in T&C workers' workplaces. Variables Negative Trend and Positive Trend are indicator variables. The variable Negative Trend takes value 1 if a worker's main employer's size has decreased more than 5 percent relative to November 1998. Similarly, the variable Positive Trend takes value 1 if a worker's main employer's size has increased more than 5 percent relative to November 1998. The variable Separation Rate is the rate at which employees leave a worker's main workplace (defined as percentages). Values are expressed in constant year 2000 Danish Kroner. Data Source: Statistics Denmark.

Table A-2: Worker Characteristics across treated versus untreated groups in 1999

	Age	Female	Immigrant	Experience
Workers employed in MFA quota producing T&C firms in 1999				
Mean	38.782	0.652	0.055	14.520
N	5211	5211	5211	5211
Workers employed in non-MFA quota producing T&C firms in 1999				
Mean	38.602	0.500	0.075	13.493
N	6378	6378	6378	6378

	College Education	Vocational Education	Union Membership	Operators and Assemblers
Workers employed in MFA quota producing T&C firms in 1999				
Mean	0.127	0.351	0.816	0.416
N	5211	5211	5211	5211
Workers employed in non-MFA quota producing T&C firms in 1999				
Mean	0.101	0.342	0.722	0.413
N	6378	6378	6378	6378

	Log Annual Salary	Log Average Hourly Wage at the Firm	Negative Trend at the Firm	Positive Trend at the Firm
Workers employed in MFA quota producing T&C firms in 1999				
Mean	12.074	5.030	0.433	0.224
N	5205	5180	5142	5142
Workers employed in non-MFA quota producing T&C firms in 1999				
Mean	11.984	5.030	0.442	0.247
N	6122	6225	6186	6186

Variables Female, Immigrant, College, and Vocational Education, Union Membership and Operators and Assemblers are worker-level indicator variables. Experience is the number of years that a worker is in the labor market. Variables College, and Vocational Education take value 1 if a worker's highest educational attainment is classified under the respective category. The outside category includes workers who have unspecified educational attainment. Log Annual Salary is the logarithm of the annual salary of workers in their initial firm. Log Average Hourly Wage is the logarithm of average hourly wages paid in workers' initial firms. Variables Negative Trend and Positive Trend are indicator variables. The variable Negative Trend takes value 1 if a worker's main employer's size has decreased more than 5 percent relative to November 1998. Similarly, the variable Positive Trend takes value 1 if a worker's main employer's size has increased more than 5 percent relative to November 1998. Data Source: Statistics Denmark.

Table A-3: Cumulative Worker Variables (2002-2010)

	Mean	Std	N
Cumulative Personal Income (in multiples of initial annual personal income)	9.783	4.941	10520
Cumulative Earnings (in multiples of initial annual earnings)	9.124	9.662	10521
Cumulative Employment	7.065	2.619	10521
Earnings Per Year of Employment (in multiples of initial annual earnings)	1.266	1.284	10101
Cumulative Hours (in multiples of initial annual hours worked)	7.794	5.987	10521
Hours Per Year of Employment (in multiples of initial annual hours worked)	1.124	0.750	10042
Hourly Wage Per Year of Employment (in multiples of initial hourly wage)	1.105	0.405	10042

Cumulative variables are defined over 2002-2010. Earnings, employment, hours worked, and hourly wages are all associated with workers' primary employment. Initial variables are the average across 1999-2000. Cumulative variables are calculated only for individuals who were still in the IDA database in 2010 as individuals may move out of Denmark or die and consequently no longer be in the database. Data Source: Statistics Denmark.