Noname manuscript No.
(will be inserted by the editor)

Old before their time: The role of employers in retirement decisions

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Abstract Do elderly workers retire early voluntarily, or are they induced to retire by their employers? We consider an exogenous shock to the labor demand induced by a trade agreement between Switzerland and the EU – the Mutual Recognition Agreement (MRA), which reduced the (fixed) cost of exporting to the EU for Swiss firms. A vast literature suggests that trade liberalizations push firms to relocate and to restructure, with large compositional effects on the labor market. We use a difference in differences approach on Swiss Labor Force Survey data to compare early retirement behavior in a treated group of MRA industries and in two control groups (non-MRA industries and services) in three periods (pre-liberalization, announcement, and implementation). We find an increase in early retirement in the MRA sector during the announcement period, which is stronger for larger firms and exporting firms. We also find an increase in the employment share of prime age (31-45 years old) workers and of graduates after the implementation. Wages are instead unaffected. Additional empirical evidence suggests that these effects are induced by increased competition in exports.

Keywords early retirement · firms restructuring · labor demand of elderly workers

JEL classification J14 · J23 · J26 · H55

We thank Eliana La Ferrara, Tommaso Nannicini, Giovanni Pica, Fabiano Schivardi, Till von Wachter, and seminar participants at CEPR-ECB Conference on "Labor supply in the aftermath of the crisis", at Bocconi University, at Università della Svizzera Italiana, at Boston College, at Center for Retirement Research and at CESifo Area Conference on Employment and Social Protection for useful comments. We also thank the Swiss Federal Statistical Office for providing the Swiss Labor Force Survey and the Business Census data through contract no. 130195 and no. 140553. Vincenzo Galasso acknowledges financial support from MIUR-PRIN 2015 Prot. n. 2015FMRE5X. Usual disclaimers apply.

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1 Introduction

For several decades after WWII, the labor market participation of (male) elderly workers has dramatically dropped. Meanwhile, longevity experienced a spectacular increase. In the last decade, however, this long run trend has been reverted, and retirement age in OECD countries started to increase. This new retirement behavior has long been advocated by experts and policy-makers as the key factor to restore the financial sustainability of unfunded pension systems. Yet, several open questions remain. Which factors contributed to the initial drop in retirement age and to the more recent changes in the retirement behavior? Do individuals' retirement decisions depend exclusively on the financial incentives, which affect the elderly workers' labour supply? What is the role of labor demand shocks? In other words, do employers induce, or even force, their workers to retire early? Providing an answer to these questions is crucial for the design of retirement policies.

Most of the economic literature on early retirement has concentrated on the labor supply, by emphasizing the crucial role of financial incentives (Gruber and Wise, 2008; Costa, 1998; Blöndal and Scarpetta, 1999; Henriques, 2017) and retirement regulations (Friedberg and Webb, 2005; Mastrobuoni, 2009; Staubli and Zweimüller, 2013) present in the unfunded pension schemes. A political economy literature has analyzed the motivations behind the introduction of these features, which facilitate early retirement (Conde-Ruiz and Galasso, 2003). Other contributions have examined the role played by other individual characteristics, such as health status (Currie and Madrian, 1999), joint retirement within couples (Hurd, 1990), or the existence of dependent elderly and grandchildren in the household (De Micco, 2015).

Despite survey evidence (Dorn and Sousa-Poza, 2010; Marmot et al., 2002) suggesting that workers' early retirement may not represent their voluntary decision, but rather their employers' choice, much less attention has been devoted to the role played by the firms in the retirement decisions. The seminal paper by Lazear (1979) provides the theoretical background for understanding the incentives that firms may have to terminate the job match with their elderly workers in normal times. If firms need to restructure in order to become more competitive in new or existing markets, additional incentives to accommodate their elderly workers out of the labor marker may arise. In countries featuring strict employment protection legislations, high firing costs or steep seniority wages, early retirement may represent an affordable solution for the firm. Yet, the empirical evidence of this labor demand effect on early retirement is scant.[1]

This paper aims at addressing the relevance of labor demand shocks in retirement decisions. In particular, we analyze how a trade liberalization that modifies domestic firms' opportunities in foreign markets may affect the transition to early retirement among their elderly employees. The novelty of this paper is to exploit as a source of exogenous variation a shock to the manufacturing sector in Switzerland, consisting of the introduction of bilateral trade agreements with the EU, which enhanced foreign market access for some (but not all) Swiss firms. Trade liberalizations are known to induce important reallocation effects (see Melitz and Trefler, 2012, for a review). For instance, existing firms may choose to undergo a restructuring process in order to increase their level of competitiveness (see Bustos, 2011a).

[1] Empirical evidence shows that a rise in the non-wage labor cost increases the retirement rate (Hallberg, 2011); firms with higher labor costs feature a lower retirement age among their workers (Frimmel et al., 2015); and recessions in countries featuring a strict employment protection legislation are associated with a higher share of involuntary retirement (Dorn and Sousa-Poza, 2010). On the other hand, the introduction of partial experience rating in unemployment benefits for large Finnish firms reduced the unemployment risk of their older workers (Hakola and Uusitalo, 2005).

This process modifies the firms' labor demand, and thus has an impact on labor market outcomes, particularly for the elderly workers.

Our identification strategy relies on the sectorial variation embedded in one element of the EU-Switzerland Bilateral Agreements I, known as the Mutual Recognition Agreement (MRA), which reduced technical barriers to trade between Switzerland and the EU for some, but not all, industries in the manufacturing sector. MRA introduced the mutual recognition of conformity assessments of standards, such as certificates, tests, product authorizations, across a wide range of industrial products, thereby simplifying procedures and reducing costs for producers in both markets. Indeed, Switzerland had already moved towards this mutual recognition by unilaterally opening the Swiss market to products holding a EU conformity certification. The MRA, which allowed only one conformity test to be required for a product to be sold in both Swiss and EU markets, thus affected mainly the Swiss exports to the EU. The elimination of the additional controls obtained through the MRA reduced the total cost of the products and the time delay due to double testing. Crucially for our research design, this Mutual Recognition Agreement did not affect all the industries in the manufacturing sector, and none in the service sector.[2] The choice of the sectors to be covered by the MRA followed the blueprints already established for the conformity tests in the negotiation for the European Single Market. The MRA between the EU and Switzerland included sectors typically covered by the conformity agreements (see De Brito et al., 2016), such as telecoms equipment, good manufacturing practices for medicines and electronic goods, because of compatibility or interoperability requirements, but also other sectors such as medical devices, pressure equipment or machinery. The Bilateral Agreements I were signed, and publicly announced in 1999. Besides the MRA, the Bilateral Agreements I included also other treaties. Yet, the sectorial variation is exclusive to MRA. The agreements were approved by the Swiss citizens in 2000 with a referendum, and were finally implemented in June 2002.

The timing of the MRA and its sectorial variation allow us to identify a treatment group of industries in the manufacturing sector, and two control groups – the unaffected industries in the manufacturing sector, and the service sector. The treatment thus consists of providing firms in the sectors covered by the MRA a more simplified and less costly access to the EU market than the control groups.[3] As reviewed in details at Section 2, these liberalizations produce both within-sector reallocation and within-firm productivity changes, which induce large effects on the labor demand. We are interested in analyzing the effect on early retirement of a reduction in the labor demand of elderly workers, due to firms' restructuring. If firms choose to restructure, with the goal of becoming more efficient in order to compete on the EU market, they modify the composition of their labor force by substituting (expensive) elderly workers with more mobile, educated and younger workers.

We distinguish between two moments in our treatment: an announcement effect, which occurred between the signature of the agreement in 1999 and its implementation in 2002; and the implementation effect, since 2002. During the announcement period, some firms in the affected manufacturing industries had an incentive to begin to restructure their labor force (Costantini and Melitz, 2007). Once the implementation took place, in 2002, the more

[2] A list of industrial products and corresponding Swiss NOGA 2002 industry codes for which the MRA between the EU and Switzerland is operational is in the appendix (Table A.1).

[3] This trade liberalization episode has been analyzed in other papers. Buehler and Burghardt (2015) focus on the MRA and show that this agreement reduced the treated plants' probability of being vertically integrated by about 10 percent, Buehler et al. (2013) and Helm (2013) study, instead, the overall effects of the Bilateral Agreements I. They show respectively that the Bilateral Agreements I increased the employment growth of affected plants by 1-2 percentage points and decreased the exit rates of about 1.5 percentage points.

efficient firms were able to exploit this enlargement opportunity. We thus use a diff-in-diff approach that exploits these two thresholds: 1999 and 2002. Our main goal is to study the effects of these labor demand shocks induced by the trade agreement on the retirement behavior of male individuals aged between 56 and 64 years. The Swiss pension system allows these individuals to retire early on second pillar pensions, even if eligibility for first pillar pensions from the public unfunded scheme has not yet been reached.

To address these issues, we exploit three distinct datasets. Information on the individual retirement decisions are obtained from the Swiss Labor Force Survey, which covers a representative sample of the Swiss population, and provides information on workers' characteristics (sex, age, education level, current wage) and on firms' characteristics (industry, location and size). Our sample consists of 8,797 observations of male individuals aged 56-64, in 1996-2005. Data on firms' exporting behavior are obtained from the Swiss Business Census, which covers the universe of plants in the manufacture and service sectors in Switzerland. Finally, information on the degree of competition by industry, as measured by export prices, can be calculated using the Swiss-Impex database, which reports values and quantities of Swiss exported commodities in 1996-2005.[4]

Our paper contributes to understanding early retirement decisions. Unlike other papers in this empirical literature (see Section 2), our analysis provides a causal estimate of the effect of the labor demand shock induced by the trade liberalization between the EU and Switzerland on the age structure of the workforce. We find that more elderly workers retire early in the affected manufacturing industries during the announcement period. This effect is stronger in large firms and in exporting firms. The employment share of male individuals in their prime age (31-45) and the share of graduate workers increase at implementation in the MRA sectors. Individual wages are instead not affected by the trade liberalization. Additional empirical evidence shows that export prices drop in the MRA sectors – suggesting that competition indeed increases, thereby requiring firms in the MRA sectors to restructure.

The paper is structured as follows. Section 2 discusses the literature on trade liberalization and retirement. Section 3 describes the Swiss institutional framework and the Mutual recognition Agreement. Section 4 presents the methodology and the results of our empirical analysis. Section 5 concludes.

2 Trade Liberalizations and Retirement

Why do trade liberalizations, such as the Mutual Recognition Agreement between Switzerland and the EU, matter for early retirement decisions? By eliminating the costs and time delay caused by the double conformity testing, the Mutual Recognition Agreement reduces trading costs for the affected sectors. The existing theoretical literature (see Melitz and Trefler, 2012, for a review) suggests that this trade liberalization leads to important firm-level reallocations, which trigger changes in labor market outcomes, such as employment and wages, with relevant heterogenous effects.

The within sector reallocation that follows a trade liberalization induces sorting among existing firms (Melitz, 2003; Bernard et al., 2003). Two main channels are at play. First, domestic firms relinquish part of their domestic market, due to the increase in internal competition induced by the entrance of foreign firms, and the least productive firms are forced to exit the market. This leads to fewer domestic firms. However, this effect on domestic firms need not to emerge in the Swiss-EU MRA, since Switzerland unilaterally anticipated the recognition of the conformity test on imported EU products already in 1996, i.e., three

[4] Swiss-Impex database: https://www.gate.ezv.admin.ch/swissimpex/

years earlier than the trade agreements were signed. Second, the more productive domestic firms have an incentive to enter into exports. Moreover, new (productive) firms find it profitable to enter the market, and in particular the export sector. Trade liberalizations stimulate also within-plant changes in productivity (Verhoogen, 2008; Lileeva and Trefler, 2010; Bustos, 2011b; Aw et al., 2011). By reducing the cost of access to foreign markets, they provide an incentive for firms to innovate, in order to succeed in exporting. Due to the early move by Switzerland on the import of EU products, we expect only the latter channel – on Swiss exports – to play a role in our empirical analysis.

The empirical literature has largely validated these theoretical predictions. Evidence of inter-firm reallocation (see Greenaway and Kneller, 2007, and Wagner, 2007, for a survey) includes the entry of more productive firms into exports (Lileeva and Trefler, 2010). Studies of the US-Canada tariff reduction agreement show an increase in productivity at industry level after agreement, with no productivity gains at plant level (Trefler, 2004). Other empirical studies have analyzed changes in within-plant productivity that followed trade liberalizations (see López, 2005, for a survey). Evidence that trade liberalizations, by improving export opportunities, lead firms to invest in productivity and to innovate is in Lileeva and Trefler (2010), Baldwin and Gu (2004), Lileeva (2008) and Van Biesebroeck (2005). Lileeva and Trefler (2010) uncover also heterogenous effects: among the plants that begin to export after the liberalization, the largest gains in productivity are for those which were initially least productive. Closely related to our study, De Loecker (2007) shows that entry into the EU induced Slovenian firms to innovate, in order to take advantage of the new trading opportunities. Additional supporting evidence are in Bustos (2011b) and Aw et al. (2011).

As a consequence of these firm and industry level effects, trade liberalizations have also an impact on labor market outcomes. Bustos (2011a) finds that a free trade agreement in Argentina, by inducing exporters to update technology, determined a skill upgrading and an increase in the relative demand of skilled labor. Verhoogen (2008) proposes an additional mechanism through which trade affects labor: the quality upgrading mechanism. The Mexican peso devaluation in 1994 induced more productive firms to produce a larger share of higher-quality goods, and to pay higher wages in order to secure a better workforce. As a result, the within-industry wage dispersion increased. Other evidence of a positive effect of the trade liberalization on average wages, wage inequality and employment gender gap are in Revenga (1997), Harrison and Hanson (1999), Amiti and Davis (2012) and Gaddis and Pieters (2017).

In this paper, we are interested in analyzing how trade liberalizations, such as the Mutual Recognition Agreement, may affect early retirement behavior. Since the Swiss-EU MRA affected mostly the Swiss exports to the EU, we focus on the within-plant changes in productivity induced by the liberalization. These changes may have negative implications for the elderly workers, since the process of skill upgrading typically affects the age composition of the labor force. Moreover, the reallocation from job to job is more difficult for displaced elderly workers who incur higher income losses (Hijzen et al., 2010). Several contributions have in fact emphasized that elderly workers acquire firm or industry specific human capital (Rogerson, 2005), make irreversible occupational choices (Matsuyama, 1992), or may have strong reasons not to move, such as owning a house or having a spouse working in the same location (Groot and Verberne, 1997). Overall, the costs from trade liberalization for the elderly workers, in terms of higher probability of being unemployment and/or lower wages, are estimated to be substantial (Artuç, 2012; Dix-Carneiro, 2014). Some of these elderly workers may thus turn to welfare programs. Individuals living in the geographical areas, which are most affected by the (Chinese) import competition, are indeed shown to rely more on welfare transfers – including social security disability insurance (Autor et al., 2013). Yet,

few studies have explicitly analyzed the impact of trade liberalizations on the retirement decisions of the elderly workers. Fries (2014) finds that the EU Eastern enlargement in 2004 did not have age biased employment effects in Germany, although it did penalize low and medium skilled workers in terms of job destruction.[5]

3 Institutional Background

In this section, we provide some basic information on the history of the institutional relations between Switzerland and the EU, and some data on the magnitude of their trade flows. How Swiss firms – and workers – adjusted to the external demand shock induced by the trade agreements largely depends on the characteristics of the Swiss labor market, and on the pension system. These aspects are discussed later in this section.

3.1 The MRA between Switzerland and the European Union

The extent to which the trade liberalization policy, which occurred with the Mutual Recognition Agreement, is relevant to the Swiss labor market crucially depends on the magnitude of the trade flows between Switzerland and the EU. Switzerland is one of the four most important trading partners for the EU, together with the US, China, and Russia, while the EU is by far the most important trading partner for Switzerland. The initial basis of the economic trade relationship between Switzerland and the European Union was placed in 1972, when Switzerland and the other EFTA (European Free Trade Association) states approved the Free Trade Agreement with the European Community, which eliminated quotas and customs duties on industrial goods. In 1987, however, the European Single Act envisaged the creation of a single market in Europe to be achieved by 1992, with both EC and EFTA countries joining a European Economic Area. On December 1992, with a referendum the Swiss electorate declined to join the European Economic Area. As a result, the Swiss Federal Council decided to pursue its economic relations with the EU on a bilateral basis, following a pattern that other countries, such as Canada in 1998 and the US in 1999, had already undertaken. Two packages of bilateral agreements were negotiated and signed respectively in 1999 and in 2004.

The Bilateral Agreements I signed by the EU and Switzerland in 1999 included seven treaties.[6] They pertain the free movement of persons, which became fully effective only in 2007, mutual recognition agreement (MRA), public procurement markets, agriculture, overland transport, civil aviation and research. Crucially for our identification strategy, only the MRA featured some sectorial variation. In the Bilateral Agreements I, the Swiss government (and thus the Swiss firms) had little negotiation power, and thereby little influence on the selection decision of the sectors into covered (MRA) or not (non MRA) by the agreement. The negotiation started immediately after the 1992 referendum over the EEA access with a

[5] Age-biased technological changes affect retirement even when they are not induced by trade liberalizations. Profit-maximizing firms facing demand or technological shocks may find it optimal to offer generous early retirement provisions to their elderly employees in order to induce them to quit (see Hutchens, 1999, for a theoretical framework, and Bartel and Sicherman, 2005, for supporting evidence). However, training and organizational innovation may help elderly workers in the presence of technological shocks (Bartel and Sicherman, 1993; Aubert et al., 2006). The extent to which firms rely on early retirement provisions depends on labor costs and labor market institutions, but also on how much firms internalize the retirement cost.

[6] A second group of agreements, the Bilateral agreements II, were signed in 2004 but the time of implementation differs across single agreements. These treaties extend political cooperation to other areas, such as culture, pension and the environment.

request made by the Swiss government to discuss fifteen areas of interest for agreements. A year later, the EU responded with a list of the seven areas. Only these seven areas were eventually regulated under the Bilateral Agreements I. The negotiation process featured joint EU-Switzerland committees, which met regularly to discuss the different issues. Meanwhile, during this period, Switzerland was unilaterally adopting regulations, which would make the country immediately compliant with the future agreements. For instance, a 1996 law on international trade was approved in Switzerland, which allowed products with EU certifications to be imported with no need of further recognition or certification. For the MRA, the mutual recognition procedures and the selection of the sectors to be included followed the blueprints laid down by the EU for the creation of the European Economic Area. The selection of MRA and non-MRA sectors was largely based on compatibility, interoperability and safety requirements, and Switzerland had little negotiation power. Indeed, the overall negotiation power for Switzerland was quite limited in this respect, due also to a guillotine clause imposed by the EU, according to which all seven agreements had to be approved or the entire package of the Bilateral Agreements I would fail. The partition of sectors into covered by the MRA or not was thus largely exogenous for the Swiss firms. Nevertheless, due to the selection criterion used, the characteristics of these two groups of firms differ. Data from the 1995 Swiss Business Census show in fact that firms in MRA were larger – the average size of a plant was 26 workers in MRA and 13 workers in non-MRA. Moreover, the share of exporting firms was 39.7% in MRA and 20.4% in non-MRA, while the share of importing firms was 44.6% in MRA and 28.1% in non-MRA.

The MRA was signed and made public in 1999, but it was implemented only in 2002 – after the approval by the Swiss electorate in a referendum that featured 67.2% of favorable votes. In our empirical analysis, we will thus distinguish three periods: before the agreement (up to 1998), an announcement period (1999-2001) and an implementation period (from 2002). This time structure will allow us to test the existence of an announcement effect in the trade liberalization (see Costantini and Melitz, 2007). Figure 1 shows the trend of the Swiss exports towards the EU fifteen countries (EU15) from 1996 to 2005 for MRA and non-MRA sectors.[7] Until 2002, MRA and non-MRA sectors display similar dynamics, with volumes of exports being stable, or somewhat increasing. After 2002, however, exports towards the EU in the MRA strongly increased, whereas those in non-MRA sectors remained stable.[8] A report issued by the KOF Swiss Economic Institute (Abberger, 2015), which analyzes the 1992-2013 period, suggests that the probability of a product in MRA sector being exported to the EU increased by around 5% with respect to a product in non-MRA sector. Moreover, exports to the EU increased on average by 9% in MRA with respect to non-MRA sectors.

3.2 The Swiss Labor Market and Pension System

The labor demand of elderly workers, and the extent to which firms may find it convenient to retire elderly workers, depends on several features of the labor market. In particular, steep seniority wages increase the cost for firms of retaining elderly workers, at times when their productivity drops. Yet, tight labor market regulations may make it costly for firms to dismiss them. The Swiss labor market is characterized by strong seniority wages (OECD, 2011): the labor earnings of males aged 55-59 is in fact 50% higher than those of male

[7] For this figure product-level data from the Swiss-Impex database are used. The State Secretariat for Economic Affairs (SECO) helped us classify the tariff codes into our two groups of industries.

[8] We do not report data on import, since Switzerland unilaterally anticipated the recognition of EU products for its internal market.

workers in the 25-29 age group. Compared to other OECD countries, Switzerland is in the same range as Italy or the US, but higher than most Scandinavian countries (around 25% higher wages for the elderly) and than UK and Australia (around 15%). On the contrary, the degree of labor market regulation, as measured by the OECD's Employment Protection Regulation index, is rather low: around 1.6 for regular workers – thereby higher than in the UK (1.1) or the US (0.25), but substantially lower than in Italy, France or Germany (between 2.4 and 2.7). Despite the high labor cost for the elderly workers, and the flexibility of the labor market that would allow for easy dismissals, Swiss firms refrain from massive layoffs of costly elderly workers, in part because of social concerns. Firms involved in within-plant reallocations, which affect the age composition of the labor force, may prefer to induce workers to use early retirement options. This is what the individuals' responses to a question on the reasons for taking early retirement, which was asked in the 2002 and 2005 waves of the Swiss Labor Force Survey, seem to suggest. The most common reason for early retirement among male workers was company reorganization (21.6%), followed by bad health (16%), and leisure motives (14%). Overall, employers driven motivations – namely, company closed down, company reorganization, and attractiveness of the retirement package offered by the employer – accounted for more than one third of the early retirement.

In Switzerland, retirement gives access to two types of pension benefits, since the pension scheme is based on two pillars. The first pillar consists of the state-run basic PAYG old age system. This scheme is mandatory for all employees, self-employed, and unemployed individuals over the age of 20. This unfunded system is financed by payroll taxes, which amount to 9.8% of the individual's labor market income. The general retirement age is currently 65 for men and 64 for women.[9] The option of drawing an early retirement pension was introduced in the system in 1997, with the 10th AHV revision. After this reform, individuals were allowed to claim benefits up to one year (and after 2001 to two years) prior to the general retirement age. The benefits are actuarially adjusted in case of early retirement. Pension benefits are reduced by an amount between 3.4% and 6.8% for each year of early withdrawal. On the other hand, pension benefits increase by over 5.2% per year if a pension is drawn after the normal retirement age (but within a five year period).

The second pillar consists of fully-funded company pension plans. They are compulsory for these employees, whose income exceeds a minimum threshold. Employees, whose income is below the threshold, and self-employed persons may choose to self-insure. The total contribution to be shared between employers and employees amounts on average to 17% of the individual wage. The minimum age of entitlement varies across pension plans. However, many plans allow early retirement, by offering an option for early withdrawal from employment with actuarially fair reductions. Other private plans may even provide supplementary pensions to bridge the gap until the individual is eligible to receive his public first pillar pension. On average, the observed retirement in occupational plans is substantially below the statutory age even in funds that do not explicitly subsidize early retirement (see Bütler et al., 2004).

[9] The normal retirement age for women was raised in two steps from 62 to 63 years in 2001, and to 64 years in 2005.

4 Empirical Analysis

4.1 The data

In our analysis, we use data from the Swiss Labor Force Survey (SLFS), a rotating panel with up to five interviews per person, which covers a representative sample of the Swiss population. Since 1991, the Federal Statistical Office has conducted the SLFS on an annual basis. The data provide information on sex, age, education level, and current wage, as well as detailed information on industry, location and size of the firm in which the individual is/was employed. In particular, the industry is identified by the NOGA 2002 (Swiss) classification.[10] We use the Directive 98/37/EC, as provided in EC (2002) and EC (2003), to match the sectors covered by the MRA with the corresponding four-digit industries of the NOGA code (see also Buehler and Burghardt, 2015).
In this empirical analysis, we concentrate on four outcomes of interest: early retirement, wages, age structure and skill composition of the workforce.

To analyze the individual retirement behavior, we use a sample of about 8,797 observations of men aged from 56 to 64 years in the years 1996-2005. Since 1996, the SLFS provides information on the actual labor market activity of the respondents, who are working at the time of the survey, but also on their previous job, for those out of the labor force. Using this information, we define early retirement to occur when an individual aged from 56 to 64 is currently out of the labor force, but was working in the previous year.[11] We use the survey cross-sectionally in order to increase the size of our sample of elderly workers. We concentrate on male workers only, since social security requirements for women are less stringent and have been modified over the time span of our analysis. To analyze the impact of the change in trade policy originated by the Bilateral Agreements on the probability of early retirement, we identify male individuals employed in industries, which were subject to the Mutual Recognition Agreement (MRA), as the treatment group and we compare them to two control groups composed of individuals employed in manufacturing industries, which were not covered by the MRA (non-MRA), or in the service sector.[12] Table 1 (Panel 1) provides the summary statistics for our variables of interest over the entire (1996-2005) period for these three groups. For the period prior to the approval of the Bilateral Agreements (1996-1998), Table 2 compares the descriptive statistics for MRA vs non-MRA group in Panel 1, and for MRA vs services in Panel 2. Prior to the shock, individuals in these groups did not differ in education, nationality and marital status, but individuals in the treatment group were employed in larger firm plants than those in both control groups. This is consistent with the differences at firm level between MRA and non-MRA induced by the selection criterion followed by the EU, and exogenous to the Swiss firms (see Section 3.1). We control for these variables in our regressions.

Besides early retirement, the labor demand shock induced by the trade liberalization may also affect wages, employment by age groups and the skill composition of the workforce. To examine these effects, we consider a sample of 63,706 observations of male individuals aged 18 to 64 over the 1996-2005 period. As before, individuals employed in industries subject

[10] The classification used in the EU, which corresponds to the Swiss 4-digit NOGA, is the 4-digit NACE.

[11] Since our dataset does not allow us to know whether an individual collects pension benefits on the first and/or second pillar, we use this definition in order to exclude elderly individuals, who are still looking for a job. We instead include all the elderly individuals, who are out of the labor force, regardless of whether they actually receive a pension benefit.

[12] In the service group, we do not include the following industries: Trade Vehicles, Whole and Commission Trade, which may be affected by the MRA; Public administration, Education, Health, which may include non-profit oriented firms; and Private Household.

to the Mutual Recognition Agreement (MRA) belong to the treatment group, which we compare to our two control groups – non-MRA and services. Table 1 (Panel 2) provides the summary statistics for our variables of interest over the 1996-2005 period for these three groups.

4.2 Descriptive Evidence

The retirement dynamics in the MRA and non-MRA industries and in the services can be appreciated at Figure 2, which displays the share of early retirees among males aged 55-64 in these three groups. The vertical bars are suggestive of the three time periods of interest: 1996-98 represents the pre-treatment period, i.e., before the announcement; 1999-2001 is the announcement period; and 2002-2005 is the implementation period. A visual inspection suggests that early retirement was more widely used in MRA manufacturing industries with respect to the two control groups (non-MRA manufacturing industries in Figure 2 (a), and service sector in Figure 2 (b)) during the announcement period, and particularly in 1999 and in 2000. No substantial differences emerge instead during the implementation period.

Table 3 summarizes levels and changes in the average share of early retirees across the three groups of industries in the pre-treatment, announcement and implementation period. These averages are calculated using data in the years before the Bilateral Agreements were signed (years 1996-1998, *Before*), in the years between the signature and the implementation (1999-2001, *Announcement*), and in the years after the implementation (2002-2005, *After*). The statistics in Panels 1 and 2 show that before the treatment period the probability of opting for early retirement was on average the same in the treatment and in the control groups. In the Announcement period, a significant difference emerges across groups, due to the contemporaneous increase in early retirement in the treatment group and decrease in the control groups. After 2002, i.e., in the implementation period, the difference disappears as early retirement in the treatment group decreases, while it increases in both control groups.

4.3 Empirical Strategy

To investigate the impact of the change in trade policy on the labor market variables of interest, we use a difference in differences estimation approach, which compares the pre-treatment period (1996-1998) to the announcement period (1999-2001) and to the after implementation period (2002-2005). We run individual-level linear regressions to compare changes in the early retirement take-up between the two groups of individuals during these three periods.[13] We use this linear regression model also to identify the possible effect of the MRA on the other labor market outcomes. We compare wages, employment shares by age group and skill composition of the workforce – across the treatment and the control groups for these three periods.[14]

The baseline difference in differences estimator is the following:

[12] Note: Own calculations using weighted data from the SLFS.

[13] In the regressions, early retirement is operationalized as a dummy variable. All results are robust to using a probit estimator. Results are available upon request.

[14] In the wage regressions, we use as dependent variable the log of the individual net hourly wage, defined as the log of the ratio between the total net annual compensation and the average hours worked per week times 48 weeks per year; in the employment by age regressions, the dependent variable is a dummy that takes values one if the individual is in the specified age range (respectively 18-30, 31-45, 46-55, 56-64); in the skill composition regressions, the dependent variable is a dummy taking value one for graduates.

$$Y_{it} = \alpha + \gamma Treat_i + \varphi_1 Ann_t + \varphi_2 After_t + \beta_1 Treat_i * Ann_t + \beta_2 Treat_i * After_t + \delta X_{it} + \varepsilon_{it} \quad (1)$$

where Y_{it} is the outcome of interest, the variable $Treat_i$ accounts for average permanent differences between treatment and control group, whereas Ann_t and $After_t$ capture the temporal trends common to both groups during the announcement and the implementation period. $Treat_i * Ann_t$ and $Treat_i * After_t$ are the interaction terms between the two respective dummies and measure the true effect of the respective treatments: announcement and implementation. X_{it} is a vector of covariates controlling for firms' and individuals' or industries' characteristics. In the regressions, we include dummies for self-employment, size of the firm in which the individual is employed, marital status, macro-region of residence and nationality.[15] [16] Age fixed effects are included in the early retirement regressions, education levels are in all regressions but the ones on the skill composition of the workforce.[17] Finally, ε_{it} is an error term. We present different specifications, in which industry, year and region fixed effects are used. Standard errors are clustered at 4-digit industry level, which correspond to our level of sorting in the MRA sectors.

The difference-in-differences approach requires a common trend assumption. In the absence of the trade agreements, the difference in the outcome between the treatment group and the two control groups should have been the same. We can test for differences in the pre-treatment trends between the treatment and control groups. Table 4 presents the results of the regressions in which, for the individual early retirement decision, in the pre-treatment (1996-98) period, we compare the year by year difference between treatment and control group respectively in MRA vs non-MRA and MRA vs services. No significant differences emerge.[18]

4.4 Results

Table 5 presents our estimation results related to the individual retirement behavior. We analyze the announcement and implementation effect of the Bilateral Agreement by comparing the early retirement behavior in the treatment group (MRA manufacturing industries) with our control groups: non-MRA manufacturing industries in columns (1) to (3), and services in columns (4) to (6). Columns (1) and (4) report the estimates of equation 1 with no control variables; in columns (2) and (5), control variables, age, year and region fixed effects are included, and in columns (3) and (6) the results include also firm size and industry dummies.

The comparison on retirement behavior in firms belonging to MRA versus non-MRA manufacturing industries shows that more early retirement takes place in the affected sectors during the announcement period. In fact, the coefficient on the interaction term *Treatment*Ann* is statistically significant and positive in all columns (1) to (3). The signature

[15] We consider five different levels of firm size (n).The variable is equal to 1 if $n <= 10$; = 2 if $n > 10$ and $n < 20$; = 3 if $n >= 20$ and $n < 50$; = 4 if $n >= 50$ and $n < 99$; = 5 if $n > 99$.

[16] Seven macro-regions are identified. Macro-region 1 includes Vaud, Valais, and Geneva; macro-region 2 includes Bern, Fribourg, Solothurn, Neuchï¿½tel, and Jura; macro-region 3 includes Basel City, Basel Land, and Argovia; macro-region 4 includes Zurich; macro-region 5 includes Glarus, Schaffhausen, Appenzell O. Rh., Appenzell I. Rh., St. Gall, Grisons, and Thurgovia; macro-region 6 includes Lucerne, Uri, Schwyz, Nidwald, Obwald, and Zug; macro-region 7 includes Ticino.

[17] The variable is equal to 1 for individuals with primary or lower secondary education, to 2 for those with upper secondary education and 3 for postsecondary and tertiary education

[18] Tables A.2 and A.4 in the appendix present the same analysis for individual wage, age and skill composition. No difference emerges in the pre-treatment period with only some exceptions for the wages.

of the agreement is indeed associated with an increase of approximately 7% in early labor force withdrawal. Instead, the coefficient on the interaction term *Treatment*After* is never statistically significant: the actual implementation of the MRA does not seem to induce early labor force withdrawal. The same results emerge from columns (4) to (6), where the difference between the treatment group and the second control group – services – is reported. The coefficient on the interaction term *Announcement*After* is again statistically significant and positive; whereas the coefficient on the interaction term *Treatment*After* is never statistically different from zero. In line with the dynamics of the individual early retirement behavior shown at Figure 2, these results suggest that the dynamics taking place in the MRA firms at the time of the announcement is associated with a substantial increase in early retirement.

According to the existing literature, surveyed at Section 2, we expect these demand shocks to have a stronger impact on larger and exporting firms, which are more exposed to the effect of the trade liberalization, and thus induced to make larger adjustments to their labor force. In Table 6, we show the results of the regressions, in which we interact our treatments with the size of the firms.[19] When comparing MRA to non-MRA firms, the increase in early retirement at announcement proves indeed to be particularly strong in large firms.

To test the effects on exporting firms, we use 1995 Swiss Business Census data to create a pre-liberalization index of exports for each sector.[20] This sectorial index of exports is then assigned to each firm in each sector. Table 7 reports the results of the regressions, in which our treatments are interacted with the export index. Our empirical results, which compare MRA with non-MRA sectors, show a much larger use of the early retirement at announcement in firms operating in more exporting sectors.

To further examine these labor market effects, we exploit the individual data for the sample of male individuals aged 18 to 64 in the 1996-2005 period. We construct the empirical kernels of the male workers' distribution by age in the MRA, non-MRA and services in 1998, 2001 and 2004, corresponding respectively to the last year prior to the announcement, to the last year prior to the implementation and to last year prior to the Bilateral Agreements II. For the treatment group, these three distributions are suggestive of the age composition at three points in time: prior to the trade agreement, after an initial adjustment induced by the announcement has taken place, and after the adjustment driven by the implementation has had some time to become effective. Figure 3 (a) compares MRA to non-MRA, while Figure 3 (b) shows MRA vs services. In 1998, the age distributions in the MRA and non-MRA were very similar (there is no significant difference according to the Kolmogorov Smirnov test), but they diverged in 2001, as the share of elderly workers decreased and the share of individuals in their thirties increased relatively to the non-MRA sector. They remained different in 2004. A comparison between MRA and services suggests instead that the age distributions in these two groups were initially somewhat different (although not significantly different according to the Kolmogorov Smirnov test) in 1998, but they became increasingly similar in 2001 and 2004.

In the following tables, we test whether the churning induced by the trade liberalization had an impact on other labor market outcomes: individual wages, employment share and

[19] We construct three firm size dummies: small firms, which is the omitted variable at Table 6 , have less than 20 workers; medium firms have between 20 and 99 workers, and large firms have 100 or more workers.

[20] The Swiss Business Census, compiled by the Swiss Federal Statistical Office, covers the universe of plants with more than 20 weekly aggregate working hours in the manufacture and service sectors. It contains detailed information on location, sector of activity, number of employees of about 300,000 firms. We aggregate our firm-level observations to the 4-digit NOGA industry level, calculate the share of exporting firms by industry level, and classify the industries in our three groups (MRA, non MRA, Services).

share of graduates by age group. For four age groups (18-30, 31-45, 46-55 and 56-64), we compare our variables of interest in the treatment group (MRA manufacturing industries) with our control groups: non-MRA manufacturing industries in columns (1) to (4), and services in columns (5) to (8).
The results in Table 8 suggest that individual wages were not affected by the trade liberalization. Evidence in Table 9 shows instead an increase in the share of male workers in the 31-45 age group at implementation in the MRA (compared to non-MRA), compensated by an equivalent reduction for younger workers. The skill composition by age group also changed, as shown in Table 10. At announcement, the share of graduates increased among the elderly workers (in MRA vs. non-MRA). At implementation, more graduates appeared also in the 31-45 age group (in both MRA vs. non-MRA and MRA vs. services), and in the 46-55 age group (in MRA vs. non-MRA).

Taken together, the empirical evidence on early retirement, wages, age structure and skill composition, displayed in Figures 2 to 3 and in Tables 5 to 10 suggests that firms in MRA industries reacted to the trade policy by reducing their demand of elderly workers, particularly for the non-graduate, at announcement and by replacing them with younger and more-educated individuals. As expected, the use of early retirement was stronger in larger firms and for exporters.

Our final empirical analysis exploits the Swiss-Impex Database, which reports values and quantities for the commodities that Switzerland exported over the period 1996-2005, to test whether competition increased in the MRA sectors for exporting firms. The Swiss-Impex Database records export trade flows according to the tariff code. We compute export unit values, defined as total value divided by units in kilograms, for each commodity. We keep only those products that are present over the entire period of analysis. In the end, we obtain a balanced panel of 5207 exported goods (2020 in MRA and 3187 in non-MRA). Table 11 presents the descriptive statistics for quantities, values and unit values in CHF. Again, our empirical analysis refers to the specification at equation 1, and the time period spans from 1996 to 2005. Hence, we can test whether (the logs of) export unit values differ between treatment (MRA) and control groups (non-MRA) during the announcement (1999-2001) and implementation (2002-05) periods, but also whether the common trend hypothesis is satisfied prior to the treatment (i.e., for 1996-98). Results at table 12 show that export prices dropped in the implementation period. This evidence thus suggests that an increase in competitiveness in the MRA sector indeed took place for exporting firms after the implementation.

5 Concluding remarks

Retirement is a crucial aspect of all pension policies and its determinants have long been analyzed. Most of the existing literature however focuses on the workers' choice, as if retirement were exclusively a labor supply phenomenon. Yet, decisions by the employers to retain aging employees or to push them into retirement are just as relevant. Steep seniority wages, high firing costs, rigid labor market regulations and even social concerns may prevent firms from displacing elderly – and perhaps less productive – workers. Early retirement may then come as a handy solution.

However, despite some supporting evidence from survey data, the role of the firms in early retirement decisions is difficult to identify empirically. The novelty of this paper is to exploit the negotiation and implementation of the Bilateral Agreements I between the EU and Switzerland as a source of exogenous variation, which affects the labor demand of Swiss

firms. The Swiss-EU mutual recognition agreement effectively reducted the (fixed) cost of exporting in the EU for Swiss firms. As suggested by a vast literature, this may induce firms to relocate – both within and across sectors – and to innovate, with important labor market effects, particularly for the elderly workers, whose labor demand may decrease.

We use a differences in differences approach to show that in firms affected by this MRA the use of early retirement provisions increased already in 1999, when the agreement was initially signed. As expected, this effect was stronger in larger firms, and among exporters. The MRA sector featured also an increase in the employment share of individuals in their prime age (31-45), and in the share of graduates. The wage distribution by age was instead not affected. As a final supporting evidence, we also show that competition increased in the MRA sectors for exporting firms, as the export prices dropped in the implementation period. This increase in competition is consistent with exporting firms in the MRA sector wanting to restructure their labor force.

Our results have relevant policy implications. Recent reforms, which modified individuals' incentives by penalizing early retirement, have been rather successful in raising the employment rate among the elderly workers. However, the practice by large firms of inducing elderly, less productive workers to retire – for instance by providing attractive retirement packages – is still quite common. Reforms attempting to link retirement age to individuals' longevity will have to consider this additional hurdle.

Figures and Tables

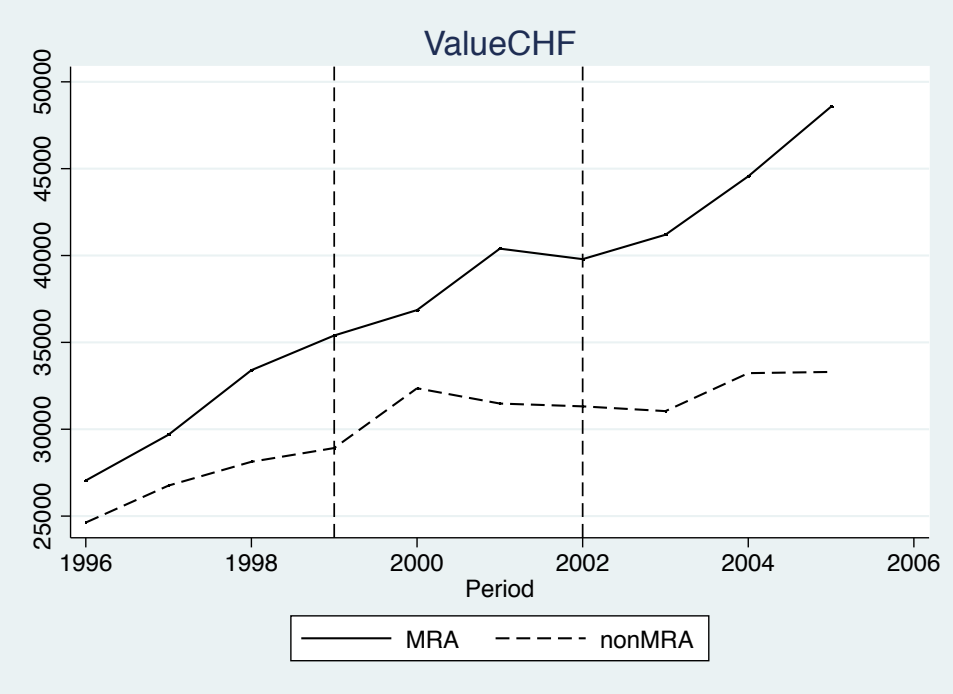
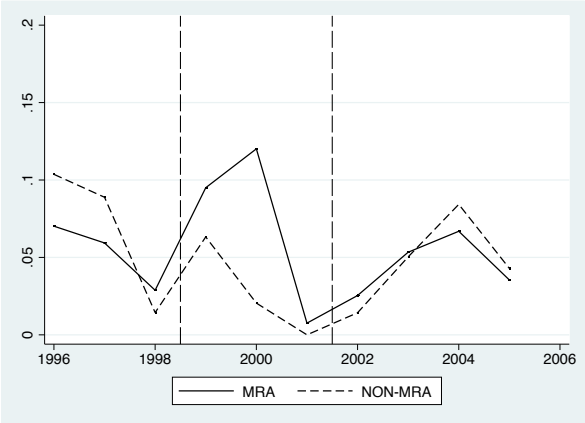
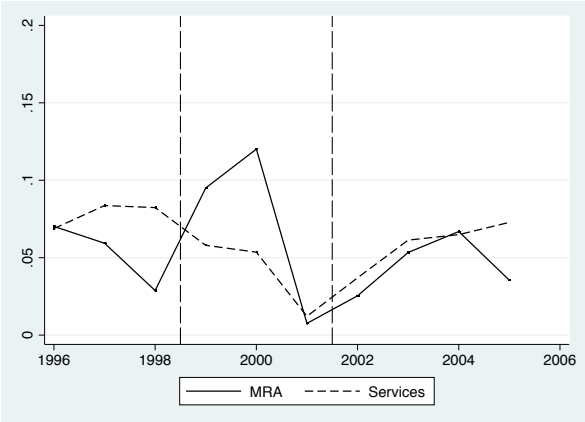


Fig. 1: Value of Swiss Exports to the
EU15 (CHF, Million), Swiss-Impex data

Fig. 2: Share of Early Retirees

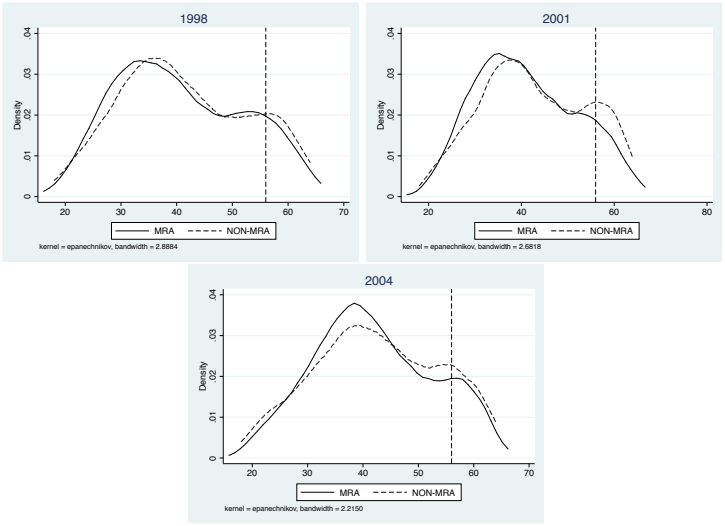


(a) Share of Early Retirees in MRA and non-MRA industries

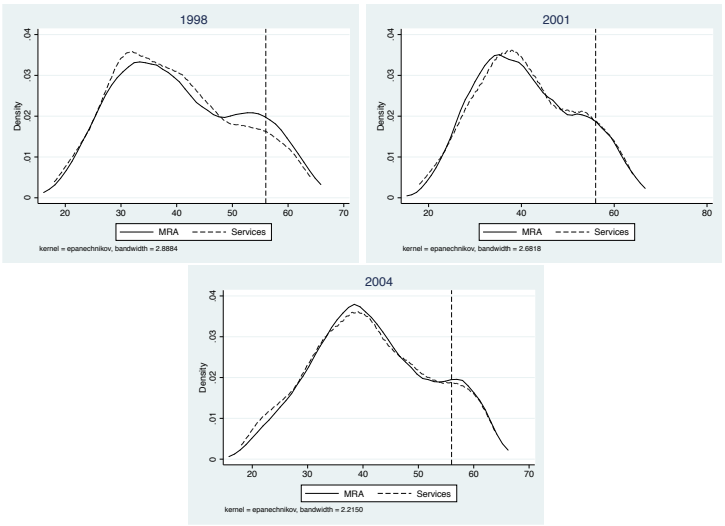


(b) Share of Early Retirees in MRA industries and in services, SLFS

Fig. 3: Workers Distribution by Age



(a) Workers Distribution by Age in MRA and non-MRA industries, SLFS



(b) Workers Distribution by Age in MRA industries and in services, SLFS

Table 1: Descriptive Statistics

Panel 1: Men 56-64						
Group	EarlyRet	Age	EduLevel	Married	Foreigner	Size
nonMRA	0.05	59.6	2.04	0.77	0.33	3.43
sd	(0.23)	(2.49)	(0.66)	(0.42)	(0.47)	(1.65)
N	1750	1750	1750	1750	1750	1730
Services	0.06	59.5	2.17	0.76	0.24	2.75
sd	(0.24)	(2.46)	(0.65)	(0.43)	(0.43)	(1.69)
N	5741	5741	5741	5741	5741	5638
MRA	0.05	59.4	2.18	0.80	0.31	4.04
sd	(0.23)	(2.42)	(0.66)	(0.40)	(0.46)	(1.43)
N	1306	1306	1306	1306	1306	1303
Total	0.06	59.5	2.15	0.77	0.27	3.08
sd	(0.24)	(2.46)	(0.65)	(0.42)	(0.44)	(1.72)
N	8797	8797	8797	8797	8797	8671

Panel 2: Men 18-64						
Group	Wage/h	Age	EduLevel	Married	Foreigner	Size
nonMRA	34.2	42.5	2.07	0.66	0.37	3.36
sd	(18.3)	(11.3)	(0.63)	(0.48)	(0.48)	(1.62)
N	9129	10301	10301	10301	10301	10191
Services	38.9	41	2.21	0.61	0.31	2.91
sd	(34.1)	(10.9)	(0.63)	(0.49)	(0.46)	(1.66)
N	38979	44274	44274	44274	44274	43540
MRA	38.2	41.7	2.25	0.65	0.35	4.03
sd	(29.6)	(10.8)	(0.63)	(0.48)	(0.47)	(1.39)
N	8103	9131	9131	9131	9131	9064
Total	38	41.3	2.2	0.63	0.33	3.15
sd	(31.4)	(11)	(0.64)	(0.48)	(0.47)	(1.67)
N	56211	63706	63706	63706	63706	62795

Note. Means of key variables in treatment and control groups: average hourly net wage, share of early retirees, average age, average level of education ("1" primary or lower secondary; "2" upper secondary education ; "3" postsecondary and tertiary education), share of married individuals, share of foreigners, average size of enterprise ("1" if $n <= 10$; "2" if $n > 10$ and $n < 20$; "3" if $n >= 20$ and $n < 50$; "4" if $n >= 50$ and $n < 99$; "5" if $n > 99$). Standard deviations in parentheses.

Table 2: Baseline Covariates (Men, 56-64)

Panel 1: MRA vs NON MRA			
	MRA	NON MRA	Difference
Age	59.299	59.514	-0.216
se	(0.172)	(0.148)	(0.228)
N	201	282	
Education Level	2.164	2.124	0.040
se	(0.042)	(0.037)	(0.056)
N	201	282	
Married	0.776	0.759	0.017
se	(0.029)	(0.026)	(0.039)
N	201	282	
Foreigner	0.154	0.188	-0.034
se	(0.026)	(0.023)	(0.035)
N	201	282	
Size	4.040	3.487	0.552***
se	(0.104)	(0.100)	(0.147)
N	201	279	
Panel 2: MRA vs SERVICES			
	MRA	Services	Difference
Age	59.299	59.626	-0.327*
se	(0.172)	(0.087)	(0.196)
N	201	818	
Education Level	2.164	2.164	0.000
se	(0.042)	(0.021)	(0.047)
N	201	818	
Married	0.776	0.758	0.018
se	(0.029)	(0.015)	(0.034)
N	201	818	
Foreigner	0.154	0.127	0.027
se	(0.026)	(0.012)	(0.027)
N	201	818	
Size	4.040	2.949	1.091***
se	(0.104)	(0.061)	(0.132)
N	201	801	

Note. Pre-treatment baseline covariates in treatment and control groups and their difference. Standard errors in parentheses. The following symbols indicate different significance levels: *** - significant at 1 percent, ** - significant at 5 percent, * - significant at 10 percent. Sample of years 1996-1998.

Table 3: Descriptive Analysis: Early retirement (Men, 56-64)

Panel 1: MRA vs NON MRA					
	Before	Announcement	After	Diff(Before-Ann.)	Diff(Before-After)
MRA	0.054	0.084	0.049	-0.029	0.005
se	(0.016)	(0.018)	(0.007)	(0.025)	(0.017)
NON MRA	0.074	0.032	0.055	0.043***	0.019
se	(0.016)	(0.010)	(0.007)	(0.018)	(0.016)
Diff	-0.020	0.052***	-0.006		
se	(0.023)	(0.020)	(0.010)		
N	3056				
Panel 2: MRA vs SERVICES					
	Before	Announcement	After	Diff(Before-Ann.)	Diff(Before-After)
MRA	0.054	0.084	0.049	-0.029	0.005
se	(0.016)	(0.018)	(0.007)	(0.025)	(0.017)
SERVICES	0.079	0.043	0.065	0.036***	0.015
se	(0.009)	(0.007)	(0.004)	(0.011)	(0.009)
Diff	-0.025	0.041***	-0.016*		
se	(0.021)	(0.016)	(0.009)		
N	7047				

Note. Share of early retirement in treatment and control groups. Standard errors in parentheses. The following symbols indicate different significance levels: *** - significant at 1 percent, ** - significant at 5 percent, * - significant at 10 percent.

Table 4: Pre-Treatment Trend, Early Retirement (Men, 56-64)

	MRA vs non-MRA			MRA vs Services		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-0.027	-0.033	-0.054	-0.008	-0.009	0.063
	(0.045)	(0.046)	(0.044)	(0.038)	(0.038)	(0.070)
Treatment*97	-0.002	-0.011	-0.011	-0.012	-0.022	-0.017
	(0.057)	(0.060)	(0.061)	(0.050)	(0.049)	(0.050)
Treatment*98	0.025	0.032	0.045	-0.037	-0.035	-0.025
	(0.054)	(0.052)	(0.053)	(0.047)	(0.047)	(0.046)
Observations	483	483	480	1,019	1,019	1,002
R-squared	0.012	0.092	0.103	0.002	0.071	0.100
Controls	NO	YES	YES	NO	YES	YES
age FE	NO	YES	YES	NO	YES	YES
size FE	NO	NO	YES	NO	NO	YES
year FE	YES	YES	YES	YES	YES	YES
region FE	NO	YES	YES	NO	YES	YES
1-digit NOGA FE	NO	NO	YES	NO	NO	YES

Note. Dependent variable: dummy variable for individuals out of the labor force in t and working in the previous year. Controls include dummies for marital, foreign, self-employment status and education level. Standard errors clustered at 4-digit industry level are in parentheses. The following symbols indicate different significance levels: *** - significant at 1 percent, ** - significant at 5 percent, * - significant at 10 percent.

Table 5: Early Retirement (Men, 56-64)

	MRA vs non-MRA			MRA vs Services		
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-0.020	-0.018	-0.024	-0.025	-0.027	-0.012
	(0.025)	(0.022)	(0.022)	(0.022)	(0.021)	(0.022)
Ann	-0.043**	-0.105***	-0.106***	-0.037***	-0.062***	-0.059***
	(0.018)	(0.023)	(0.023)	(0.011)	(0.017)	(0.018)
After	-0.019	-0.052**	-0.050**	-0.015	-0.005	0.000
	(0.018)	(0.025)	(0.025)	(0.010)	(0.013)	(0.014)
Treatment*Ann	0.072**	0.068**	0.070**	0.066**	0.055*	0.054*
	(0.034)	(0.032)	(0.032)	(0.031)	(0.032)	(0.032)
Treatment*After	0.013	0.013	0.012	0.009	0.005	-0.001
	(0.024)	(0.020)	(0.020)	(0.018)	(0.018)	(0.018)
Observations	3,056	3,056	3,033	7,047	7,047	6,941
R-squared	0.003	0.059	0.067	0.002	0.061	0.073
Controls	NO	YES	YES	NO	YES	YES
age FE	NO	YES	YES	NO	YES	YES
size FE	NO	NO	YES	NO	NO	YES
year FE	NO	YES	YES	NO	YES	YES
region FE	NO	YES	YES	NO	YES	YES
1-digit NOGA FE	NO	NO	YES	NO	NO	YES

Note. Dependent variable: dummy variable for individuals out of the labor force in t and working in the previous year. Controls include dummies for marital, foreign, self-employment status and education level. Standard errors clustered at 4-digit industry level are in parentheses.

Table 6: Early Retirement (Men, 56-64)

	MRA vs non-MRA			MRA vs Services		
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment*Ann	0.021	-0.017	-0.013	0.012	-0.013	-0.014
	(0.046)	(0.045)	(0.046)	(0.038)	(0.041)	(0.041)
Treatment*After	0.018	-0.015	-0.020	0.011	-0.017	-0.020
	(0.040)	(0.037)	(0.039)	(0.033)	(0.031)	(0.032)
Treatment*Ann*Big	0.088	0.134*	0.130*	0.077	0.099	0.102
	(0.070)	(0.069)	(0.069)	(0.066)	(0.063)	(0.063)
Treatment*After*Big	0.026	0.072	0.077	0.016	0.048	0.045
	(0.058)	(0.056)	(0.057)	(0.050)	(0.047)	(0.046)
Treatment*Ann*Medium	0.007	0.039	0.039	0.037	0.038	0.039
	(0.073)	(0.073)	(0.074)	(0.067)	(0.067)	(0.066)
Treatment*After*Medium	-0.069	-0.043	-0.036	-0.036	-0.017	-0.019
	(0.064)	(0.061)	(0.062)	(0.059)	(0.057)	(0.056)
Observations	3,056	3,056	3,033	7,047	7,047	6,941
R-squared	0.011	0.067	0.069	0.015	0.069	0.074
Controls	YES	YES	YES	YES	YES	YES
age FE	NO	YES	YES	NO	YES	YES
size FE	NO	NO	YES	NO	NO	YES
year FE	NO	YES	YES	NO	YES	YES
region FE	NO	YES	YES	NO	YES	YES
1-digit NOGA FE	NO	NO	YES	NO	NO	YES

Note. Dependent variable: dummy variable for individuals out of the labor force in t and working in the previous year. Controls include dummies for marital, foreign, self-employment status and education level. Standard errors clustered at 4-digit industry level are in parentheses. Big, Medium, Treatment, Announcement and After dummies and their interactions are included in the regression, but their coefficients are not reported.

Table 7: Early Retirement (Men, 56-64)

	MRA vs non-MRA		
	Exports	Exports	Exports
	(1)	(2)	(3)
Treatment*Ann	-0.060	-0.095	-0.091
	(0.077)	(0.076)	(0.076)
Treatment*After	-0.060	-0.067	-0.070
	(0.062)	(0.058)	(0.061)
Treatment*Ann*Index	0.229*	0.289**	0.286**
	(0.125)	(0.122)	(0.123)
Treatment*After*Index	0.130	0.146	0.151
	(0.102)	(0.094)	(0.098)
Observations	2,999	2,999	
R-squared	0.009	0.064	0.071
Controls	YES	YES	YES
age FE	NO	YES	YES
size FE	NO	NO	YES
year FE	NO	YES	YES
region FE	NO	YES	YES
1-digit NOGA FE	NO	NO	YES

Note. Dependent variable: dummy variable for individuals out of the labor force in t and working in the previous year. Index: Share of exporting plants. Controls include dummies for marital, foreign, self-employment status and education level. Treatment, Announcement and After dummies and their interactions are included in the regression, but their coefficients are not reported. Standard errors clustered at 4-digit industry level are in parentheses.

Table 8: Log Hourly Wage by Age Group (Men, 18-64)

	MRA vs non-MRA				MRA vs Services			
VARIABLES	18-30	31-45	46-55	56-64	18-30	31-45	46-55	56-64
Treatment	-0.023	0.043*	0.002	0.019	-0.068	-0.077**	-0.090*	-0.102*
	(0.029)	(0.025)	(0.042)	(0.059)	(0.054)	(0.038)	(0.050)	(0.059)
Ann	0.086***	0.028	0.020	0.116**	0.098***	0.035*	0.001	0.058
	(0.032)	(0.027)	(0.048)	(0.054)	(0.020)	(0.018)	(0.037)	(0.050)
After	0.090***	0.086***	0.027	0.114*	0.079***	0.066***	0.033	0.106***
	(0.028)	(0.021)	(0.034)	(0.059)	(0.017)	(0.016)	(0.030)	(0.039)
Treatment*Ann	0.012	0.007	-0.019	-0.012	0.015	-0.016	0.013	0.069
	(0.039)	(0.026)	(0.046)	(0.060)	(0.030)	(0.022)	(0.038)	(0.051)
Treatment*After	0.008	-0.012	0.057	0.030	0.030	-0.015	0.009	0.055
	(0.032)	(0.026)	(0.040)	(0.061)	(0.027)	(0.025)	(0.033)	(0.043)
Observations	2,768	8,087	3,714	2,532	8,603	22,846	9,390	5,629
R-squared	0.215	0.288	0.277	0.244	0.224	0.290	0.270	0.201
size FE	YES	YES	YES	YES	YES	YES	YES	YES
year FE	YES	YES	YES	YES	YES	YES	YES	YES
region FE	YES	YES	YES	YES	YES	YES	YES	YES
1-digit NOGA FE	YES	YES	YES	YES	YES	YES	YES	YES

Note. Dependent variable: log of the individual net hourly wage. We control for marital, foreign, self-employment status and education level. Standard errors clustered at 4-digit industry level are in parentheses. The following symbols indicate different significance levels: *** - significant at 1 percent, ** - significant at 5 percent, * - significant at 10 percent.

Table 9: Age Composition (Men, 18-64)

	MRA vs non-MRA				MRA vs Services			
VARIABLES	18-30	31-45	46-55	56-64	18-30	31-45	46-55	56-64
Treatment	0.035*	-0.011	-0.009	-0.015	0.048*	0.013	-0.039	-0.022
	(0.020)	(0.023)	(0.022)	(0.017)	(0.025)	(0.027)	(0.027)	(0.021)
Ann	-0.040**	0.024	-0.014	0.029	-0.072***	0.038***	0.028***	0.005
	(0.018)	(0.022)	(0.018)	(0.019)	(0.011)	(0.012)	(0.009)	(0.009)
After	-0.037**	-0.010	0.019	0.028*	-0.089***	0.021	0.039***	0.029**
	(0.016)	(0.021)	(0.016)	(0.017)	(0.012)	(0.013)	(0.009)	(0.011)
Treatment*Ann	0.001	0.019	0.007	-0.027	0.021	0.011	-0.020	-0.011
	(0.021)	(0.028)	(0.024)	(0.020)	(0.018)	(0.022)	(0.020)	(0.013)
Treatment*After	-0.044**	0.054**	-0.001	-0.009	0.004	0.023	-0.016	-0.011
	(0.019)	(0.027)	(0.022)	(0.019)	(0.017)	(0.022)	(0.017)	(0.016)
Observations	19,255	19,255	19,255	19,255	52,604	52,604	52,604	52,604
R-squared	0.123	0.024	0.014	0.026	0.156	0.024	0.023	0.032
size FE	YES	YES	YES	YES	YES	YES	YES	YES
year FE	YES	YES	YES	YES	YES	YES	YES	YES
region FE	YES	YES	YES	YES	YES	YES	YES	YES
1-digit NOGA FE	YES	YES	YES	YES	YES	YES	YES	YES

Note. Dependent variable: dummy variable for workers in the specified age range. We control for marital, foreign, self-employment status and education level.

Table 10: Skill Composition by Age Group (Men, 18-64)

	MRA vs non-MRA				MRA vs Services			
VARIABLES	18-30	31-45	46-55	56-64	18-30	31-45	46-55	56-64
Treatment	0.119***	0.041	-0.010	0.002	-0.091	-0.239***	-0.252***	-0.271***
	(0.038)	(0.032)	(0.047)	(0.057)	(0.064)	(0.054)	(0.083)	(0.094)
Ann	0.057	0.037	-0.019	-0.049	0.020	0.023	0.008	0.026
	(0.043)	(0.028)	(0.048)	(0.056)	(0.023)	(0.018)	(0.025)	(0.032)
After	0.030	0.030	-0.047	-0.016	0.057**	0.069***	0.018	0.026
	(0.040)	(0.027)	(0.037)	(0.057)	(0.027)	(0.019)	(0.026)	(0.029)
Treatment*Ann	-0.058	0.045	0.039	0.129*	-0.031	0.038	-0.006	0.072
	(0.047)	(0.034)	(0.058)	(0.076)	(0.042)	(0.029)	(0.049)	(0.066)
Treatment*After	-0.030	0.110***	0.116**	0.078	-0.053	0.077**	0.016	0.027
	(0.045)	(0.037)	(0.048)	(0.072)	(0.045)	(0.035)	(0.045)	(0.060)
Observations	3,049	8,989	4,274	2,943	9,335	25,598	10,919	6,752
R-squared	0.083	0.077	0.058	0.053	0.078	0.109	0.105	0.114
size FE	YES	YES	YES	YES	YES	YES	YES	YES
year FE	YES	YES	YES	YES	YES	YES	YES	YES
region FE	YES	YES	YES	YES	YES	YES	YES	YES
1-digit NOGA FE	YES	YES	YES	YES	YES	YES	YES	YES

Note. Dependent variable: dummy variable for graduate workers. We control for marital, foreign, and self-employment status. Standard errors clustered at 4-digit industry level are in parentheses. The following symbols indicate different significance levels: *** - significant at 1 percent, ** - significant at 5 percent, * - significant at 10 percent.

Table 11: Descriptive statistics, Swiss-Impex Data

Group	Quantity	ValueUS	UnitValue
nonMRA	2267916	9.45	.00634
sd	2.37e+07	46.2	.3
N	31870	31870	31807
MRA	880319	18.7	.000197
sd	4233068	156	.00226
N	20200	20200	20157
Total	1729612	13	.00396
sd	1.88e+07	104	.235
N	52070	52070	51964

*Note.*Means of key variables in treatment and control groups: average quantity (net weights in kilograms, 1000 unit), average trade value (1000 CHF), average unit value. The data at 8-digit product level.

Table 12: Export Prices

	MRA vs nonMRA
Treatment*1997	-0.014
	(0.023)
Treatment*1998	0.006
	(0.024)
Treatment*1999	-0.013
	(0.026)
Treatment*2000	-0.027
	(0.027)
Treatment*2001	-0.044
	(0.028)
Treatment*2002	-0.042
	(0.029)
Treatment*2003	-0.061**
	(0.029)
Treatment*2004	-0.084***
	(0.030)
Treatment*2005	-0.053*
	(0.030)
Observations	51,964
R-squared	0.001
Year FE	YES
Product FE	YES

Note. Dependent variables: Log Export Unit value in CHF defined as total value divided by units in kilograms. Treatment variable is included in the regressions, but the coefficient is not reported. Standard errors clustered at 8-digit product level are in parentheses.

Appendix

Table A.1: Industries covered by the Mutual Recognition Agreement

Product Sector	Corresponding Swiss NOGA 2002 industry code
Machinery	29.12, 29.14, 29.2, 29.32, 29.4, 29.5, 29.72
Personal protective equipment	18.21,18.24, 25.24, 28.75, 33.40, 36.40
Toys	36.50
Medical devises	33.10
Gas appliances and boilers	28.22, 28.30
Pressure Vessels	28.30,28.71
Telecomminications terminal equipment	33.20
Equipment and protective systems	28.2, 28.3, 29.23, 29.24, 29.4, 31.61, 33.2, 33.3
Electrical equipment	30, 31, 32
Construction plants and equipment	29.52
Measuring instruments and prepackages	33.20
Motor vehicle	31.61, 34
Agricultural and forestry tractors	29.31
Good laboratory practice (GLP)	15, 24.1, 24.20, 24.42, 24.51, 24.52
Medical products and GMP inspection and Bath Certification	24.42

Table A.2: Pre-Treatment Trend, Log Hourly Wage by Age Group (Men, 18-64)

	MRA vs non-MRA				MRA vs Services			
VARIABLES	18-30	31-45	46-55	56-64	18-30	31-45	46-55	56-64
Treatment*97	0.059	0.003	0.020	0.006	-0.011	0.041	-0.011	-0.015
	(0.053)	(0.033)	(0.077)	(0.062)	(0.044)	(0.027)	(0.047)	(0.062)
Treatment*98	0.121**	0.039	-0.014	-0.056	0.064*	0.063**	0.021	-0.049
	(0.048)	(0.041)	(0.061)	(0.066)	(0.038)	(0.031)	(0.053)	(0.063)
Observations	557	1,298	577	398	1,828	3,402	1,340	793
R-squared	0.235	0.267	0.263	0.331	0.216	0.240	0.271	0.158
Controls FE	YES	YES	YES	YES	YES	YES	YES	YES
size FE	YES	YES	YES	YES	YES	YES	YES	YES
year FE	YES	YES	YES	YES	YES	YES	YES	YES
region FE	YES	YES	YES	YES	YES	YES	YES	YES
1-digit NOGA FE	YES	YES	YES	YES	YES	YES	YES	YES

Note. Dependent variable: log of the individual net hourly wage. We control for marital, foreign, self-employment status and education level. Standard errors clustered at 4-digit industry level are in parentheses.

Table A.3: Pre-Treatment Trend, Age Composition (Men,18-64)

	MRA vs non-MRA				MRA vs Services			
VARIABLES	18-30	31-45	46-55	56-64	18-30	31-45	46-55	56-64
Treatment*97	0.018	-0.001	-0.011	-0.005	0.015	-0.017	0.005	-0.003
	(0.026)	(0.028)	(0.021)	(0.017)	(0.024)	(0.022)	(0.018)	(0.014)
Treatment*98	-0.007	0.016	0.018	-0.027	0.013	-0.012	0.003	-0.004
	(0.036)	(0.036)	(0.029)	(0.022)	(0.031)	(0.030)	(0.022)	(0.018)
Observations	3,201	3,201	3,201	3,201	8,331	8,331	8,331	8,331
R-squared	0.124	0.036	0.026	0.027	0.178	0.039	0.027	0.029
Controls FE	YES	YES	YES	YES	YES	YES	YES	YES
size FE	YES	YES	YES	YES	YES	YES	YES	YES
year FE	YES	YES	YES	YES	YES	YES	YES	YES
region FE	YES	YES	YES	YES	YES	YES	YES	YES
1-digit NOGA FE	YES	YES	YES	YES	YES	YES	YES	YES

Note. Dependent variable: dummy variable for workers in the specified age range. We control for marital, foreign, self-employment status and education level. Standard errors clustered at 4-digit industry level are in parentheses.

Table A.4: Pre-Treatment Trend, Skill Composition by Age Group (Men,18-64)

	MRA vs non-MRA				MRA vs Services			
VARIABLES	18-30	31-45	46-55	56-64	18-30	31-45	46-55	56-64
Treatment*97	0.032	-0.002	-0.021	-0.105*	-0.021	-0.012	-0.036	-0.049
	(0.066)	(0.037)	(0.057)	(0.061)	(0.053)	(0.026)	(0.049)	(0.050)
Treatment*98	-0.103	-0.022	-0.028	0.049	-0.092	0.001	0.019	0.044
	(0.075)	(0.048)	(0.068)	(0.094)	(0.066)	(0.038)	(0.061)	(0.088)
Observations	615	1,444	683	459	1,954	3,859	1,557	961
R-squared	0.133	0.085	0.064	0.101	0.094	0.114	0.091	0.105
Controls FE	YES	YES	YES	YES	YES	YES	YES	YES
size FE	YES	YES	YES	YES	YES	YES	YES	YES
year FE	YES	YES	YES	YES	YES	YES	YES	YES
region FE	YES	YES	YES	YES	YES	YES	YES	YES
1-digit NOGA FE	YES	YES	YES	YES	YES	YES	YES	YES

Note. Dependent variable: dummy variable for graduate workers. We control for marital, foreign and self-employment status. Standard errors clustered at 4-digit industry level are in parentheses.

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