

Relative Supply and Demand for Skills in Switzerland

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1. Introduction

During the last two to three decades, labour markets in most industrialised countries were characterised by either of two developments: Rising wage inequality or rising unemployment. In the United States and in Britain, wage inequality increased since the 1970s/1980s, but aggregate unemployment fell in the 1990s. In France and Germany, unemployment rates increased, but wage inequality hardly changed. In Switzerland, unemployment has traditionally been low in the past (almost zero percent). But in the 1990s, the aggregate unemployment rate reached a level that was last experienced in Switzerland in the 1930s, when official recording of the unemployment rate began. Figure 1 shows that the increase in unemployment went hand in hand with a real employment decline and is thus not just a statistical measurement phenomenon. However, Swiss unemployment

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Figure 1: Unemployment and Employment Rates (in Percent)



Note: Unemployment rate on the left ordinate, employment rate on the right ordinate.

Source: *Bundesamt für Statistik* (Swiss Federal Statistical Office).

was still low in the 1990s by international standards, despite the deep macroeconomic crisis experienced by the country.

This paper shows how the relative demand and supply for skills changed in the Swiss labour market since the early 1990s. By combining a German-style vocational (apprenticeship) education system with almost American labour market flexibility, Switzerland is an interesting testing ground for several hypotheses raised in the literature concerning recent wage and (un)employment developments in the industrialised countries.¹ First, I investigate whether Switzerland

1 Although most popular debates revolve around unemployment developments, this paper will implicitly focus on employment rather than unemployment. The reason is that employment as a source of productive income is usually seen as more important by labour economists than unemployment, the latter being more prone to definitional and measurement issues. Hence, I will refer to the 'period of rising and falling unemployment' in Switzerland, in this paper, but not analyse unemployment directly, but instead implicitly measure relative employment-

experienced an increase in the demand for high- versus low-skilled labour as has been shown for the United States. Second, I ask whether the relative supply of skills increased sufficiently to complement the changes in relative demand. Third, I test whether there is evidence for relative wage rigidities preventing the relative wages of high- versus low-skilled labour to accommodate changes in the relative demand and supply for skills. Such rigidities may potentially be responsible for part of the employment decline in the 1990s. Fourth, I ask whether immigration policy has been used as an alternative to the price (wage) mechanism to adjust relative demand and supply for skills.

In an international context, the answers to these questions have a bearing on the view that an increase in wage inequality or unemployment is a necessary consequence of skill-biased technological change or globalization across the *whole* industrialised world, because negative relative demand shocks against the low-skilled were experienced *everywhere*.² Two alternative views would be, first, that changes in the relative supply of skills differ across countries thus affecting market-clearing relative wages between skill groups (GOTTSCHALK and JOYCE, 1998). A second alternative view is that differences in the educational systems did not lead to the same relative demand shocks against the low skilled, because the 'low skilled' in some countries may have more human capital than the 'low skilled' in other countries. This has previously been argued for Switzerland by NICKELL and BELL (1996) and for Germany by FREEMAN and SCHETTKAT (2000) in the context of the vocational education (apprenticeship) system.

Compared to many major industrialised countries, Switzerland has a very low share of the workforce with tertiary (higher) education (only 9 percent of the working age population in 2000 according to the Swiss Labour Force Survey). Thus, rising relative demand for skills may create a serious problem for large parts of the Swiss work force due to undereducation. On the other hand, Switzerland (similar to Germany) provides a potentially high level of vocational education to large parts of its low-skilled labour force through its apprenticeship system. It is therefore important to ask the question whether the peculiar Swiss skill structure consisting of few workers with high skills, but also few workers with very

population ratios (*cf.* equation (6) in Section 4 below). An analysis of flows between different labour force states in Switzerland can be found in DJURDJEVIC (2005). Specific policies to tackle unemployment are discussed and evaluated in GERFIN and LECHNER (2002) and FRÖLICH, LECHNER and STEIGER (2003).

2 For a discussion of the potential causes of negative relative demand shocks against the low skilled, see ACEMOGLU (2002), BERMAN, BOUND and MACHIN (1998) and MACHIN and VAN REENEN (1998).

low skills (*i.e.* below apprenticeship training) really faced a relative demand shock against its major low-skill group, that is workers with apprenticeship training. As the distinction between workers with and without apprenticeship training is very important in Switzerland, a separate consideration of the relative supply and demand for these two types of low-skill workers is important. Relative demand changes for different types of skill thus have policy implications ranging from the expansion of higher education, like the introduction of polytechnics (*Fachhochschulen*) in Switzerland since 1995, to policies aiming to boost the qualifications of the least skilled (as done in Britain through New Deal policies, for example). Immigration control is a potential alternative to educational policies, as both policies can be used to adjust the relative supply of skills in a country. However, given that educational policies permeate not only the native but also the younger immigrant population, such policies might have a greater momentum on the labour market, although they might imply higher costs and more time to feed through.

The paper is structured as follows. Section 2 gives a brief institutional overview of features of the Swiss labour market key to the questions of this paper. The data are presented in Section 3. Section 4 provides the theoretical framework used to empirically identify relative demand and supply for skills as well as relative wage rigidity and discusses the empirical results. It is shown that Switzerland experienced continuously increasing relative demand for high- versus low-skilled labour in the period 1991 to 2003. This is true both at the higher and the lower end of the skill spectrum (ranging from *higher education* to *apprenticeship training* and from *apprenticeship training* to *mandatory school or less*, respectively). However, the relative supply of skills increased as well such as to neutralise changes in relative demand. This finding is supportive of current Swiss policies to promote higher education. Although there is some tentative evidence for relative wage rigidity at the lower end of the skill spectrum, the size of relative wage rigidity is small relative to simulated wage effects of relative demand and supply for skills changes. Furthermore, I find that – contrary to popular believe, especially outside of Switzerland – immigration policy did not contribute to lowering the relative supply of low-skilled workers. Instead, most immigrant groups changed the skill distribution in an unfavourable way for low-skilled workers. Section 5 concludes.

2. The Swiss Education and Immigration Systems

The Swiss education system is rather different from the ones in the United States or in Britain. 49 percent of the working age population have completed vocational (apprenticeship) training.³ Although people in Switzerland finish their apprenticeship at roughly the same age as high school graduates in American high schools, the content of their education is rather different. The two to four year apprenticeship period consists mostly of on-the-job training in a company for a well-specified profession (which can be a craft or a white-collar job) plus one or two days of classroom training per week. Another 22 percent of the Swiss working age population has no apprenticeship training, only schooling below the 'high school' level. These two groups (workers with and without apprenticeship training) are defined as the lower end of the Swiss skill spectrum here, as they hold the two lowest ranks in the Swiss wage hierarchy (*cf.* PUHANI, 2003). Together, they make up 71 percent of the Swiss working age population. The other educational groups are those with an academic degree (9 percent), higher vocational education (12 percent; *e.g.* *Fachschule*), and advanced high school (8 percent, *Matura*). In the U.S. literature, one usually distinguishes between four skill groups, those with a college degree (24 percent of the working age population), those with some college education (27 percent), high school graduates (32 percent) and high school dropouts (16 percent). The latter two groups, *i.e.* 48 percent of the working age population, are generally regarded as low-skilled in the empirical literature.

The following differences in the educational structures between Switzerland and the U.S. are worth mentioning in the current context. First, at face value the lower end of the skill spectrum in Switzerland is larger than in the U.S. (71 against 48 percent). Second, the largest part of workers at the lower end of the skill spectrum in Switzerland received a rather different *type* of education (namely apprenticeship) than the low-skilled in the United States. Third, a much higher share of the working age population has a higher education degree in the United States than in Switzerland. Of course, the question remains how far the qualities of these educational groups are comparable. NICKELL and BELL (1996) provide evidence that the Swiss education system generates significantly higher test scores on average than the U.S. and British systems. This higher average is largely explained by better Swiss test results at the lower end of the skill spectrum. FREEMAN and SCHETTKAT (2000) similarly show on the basis of adult literacy scores

3 Shares of educational groups are based on own calculations (using sampling weights) for the working age population (age 16 to 65) in the labour force surveys of the respective countries in 2000.

that the German education system produces a more compressed skill distribution than the one of the United States. That is, Germany exhibits much less probability mass at the lower end of the skill spectrum than the US and also somewhat less mass at the higher end. Given that the Swiss and German education systems show a lot of similarities (indeed, the types of educational groups and their shares in the German working age population are virtually identical to the ones reported above for Switzerland), these results give considerable credence to the view that the Swiss education system is not only different by design from the Anglo-Saxon ones, but also produces a distinct skill distribution. It is thus questionable whether the skill-biased technological change hypothesis applies to Switzerland as it applies to the United States (*cf.* ACEMOGLU, 2003). A constant Swiss wage structure may thus not be the result of wage rigidities (as claimed generally for Europe in the KRUGMAN, 1994, hypothesis), but it may also be due to the fact that Switzerland does not have so many low-skilled workers as the United States.

On the other hand, Switzerland may have experienced relative demand shocks against the low skilled as the rest of the world, but supply-side policies to boost higher education (as the introduction of the polytechnics, *Fachhochschulen*) may have prevented changes in the wage structure between education groups by netting out relative demand changes. However, given its high share of immigrants (around 20 percent of the population), immigration policy is an alternative supply-side mechanism potentially affecting the Swiss skill structure.

Indeed, one explanation put forward for why Swiss unemployment has been very low in the past is the flexible system of work permits that Switzerland operates (*cf.* LIEBIG, 2002, on Swiss immigration policy). The main categories of immigrant workers in the 1990s were frontier persons (G-permit), who are not allowed to stay overnight in Switzerland, seasonal workers (A-permit; now abolished), who must not stay in Switzerland for longer than 9 months per year and have to get their permit renewed every year, annual (B-permit) workers, who have to get their permit renewed until they receive almost automatically a permanent (C) residence permit after five or ten years in the country (depending on their nationality). The share of permanent (C) residents among resident (B and C) immigrants increased from 28 percent in 1960 to 37, 77, 75, and 75 percent in 1970, 1980, 1990, and 2000, respectively (*Bundesamt für Ausländerfragen*, 2000).⁴ Since 1988, there have been 4 popular votes initiated by right-wing

4 This has also been documented by the OECD (1996) and FLÜCKIGER (1998), where evidence is provided that both the permanent and non-permanent workforce were less elastic to shocks in the late 1980s / early 1990s than in the 1970s / early 1980s.

groups to limit the share of immigrants in the population, which is currently around 20 percent. All these initiatives have been rejected by the Swiss people (although the vote on limiting the number of asylum seekers in 2002 was very close), but so has been a government proposal for 'easier naturalisation of young immigrants' in 1994. In the same year, the Swiss people also accepted a proposal for 'forceful measures in immigrant law' (details on all these popular votes can be found in French and German on the internet page www.admin.ch).

These popular votes demonstrate that immigration is an important and topical issue in Switzerland. Therefore, the investigation of relative supply and demand for skill changes in this paper will be complemented by an analysis of the potential labour supply effects generated by variations in the immigrant population. This question is interesting from a policy point of view, as temporary work permits exist also for the purpose of allowing some labour supply fine tuning.

3. Data

The only representative individual data source for Switzerland which allows a continuous monitoring of the Swiss labour market and working age population since the early 1990s is the Swiss Labour Force Survey (SLFS, abbreviated *SAKE* in German, *ESPA* in French). I use all annual surveys from 1991 to 2003.⁵ The SLFS includes immigrants with B and C permits, *i.e.* official residents of Switzerland, which excludes persons with frontier (G-) permit and seasonal workers (A-permit). Only people aged 16 to 65 are included in my samples. Apprentices are excluded from wage measurement, because the *hours worked in the firm* information is not consistently available for the whole observation period. So are self-employed workers, because it is unclear how much of their income is attributable to human versus physical capital. The wage variable is earnings divided by normal hours worked.

Because the SLFS contains representative (if the provided weights are used) information on the Swiss population, these data allow a simulation of labour supply and demand changes, as described in the following section. The supply/demand comparison will in essence be based on differences in working age population and employment across skill groups.

5 The Swiss Wage Structure Survey (*Lohnstrukturerhebung*, WSS) only started in 1994 and contains no information on non-employed persons, which is essential for this analysis. Besides, the WSS has about 17 percent missings in the education variable which is crucial to this paper.

All analyses are carried out using the cross-sectional weights provided in the SLFS by the Swiss authorities (this is important especially for the analysis of immigrants, who are underrepresented in all survey years except 2003, where they are over-represented). As to the labour market characteristics, dummy variables are used to define age, highest educational attainment, gender, and regional categories.⁶ These dummy variables are used in the analyses below to define cells of heterogeneous types of labour, which are then aggregated into high- and low-skill groups.

The following analyses consider two ranges of the skill spectrum to investigate the wage effects of demand and supply changes. At the higher end of the skill spectrum, I define workers with a higher education degree as high-skilled and workers with apprenticeship as low-skilled (in analogy to the existing U.S. literature cited below). At the lower end of the skill spectrum, I define workers with an apprenticeship as high-skilled and workers without apprenticeship as low-skilled. Other educational groups are partially allocated to either of these education categories as in KATZ and MURPHY (1992), AUTOR, KATZ and KRUEGER (1998) and ACEMOGLU (2003) (*cf.* Section 4). The complete set of educational degrees on the basis of which cells of heterogeneous types of labour are built, is defined as follows: *Higher education* includes *Universität* and *Hochschule*; *higher vocational* education subsumes any type of *Fachschule* plus the *Meister* degree; *advanced high school* denotes *Matura*; *apprenticeship* consists of *Diplommittelschule* plus any type of *Lehre* (apprenticeship) except *Anlehre* (low profile apprenticeship). People with only *Anlehre* (low profile apprenticeship), any other form of education, mandatory school, or no formal degree at all are subsumed under the education category *mandatory school or less*.

6 Region is classified according to which language is spoken in the canton (Swiss political sub-unit). The French and Italian parts are subsumed under the category 'Latin', as sometimes done in Switzerland (there are not that many observations – especially on immigrants – for the rather small Italian part of Switzerland in the sample).

4. Relative Supply and Demand for Skills in the Swiss Labour Market

This section estimates relative wage effects of changes in the relative supply and demand for skills in the Swiss labour market since the early 1990s using data from the SLFS. KATZ and MURPHY (1992) have among others documented the secular increase in the relative demand for high- versus low-skilled labour in the United States. Although the relative supply of high-skilled labour increased, relative demand outpaced the supply increase, which can explain the rising skill premium in the US in the 1980s and mid 1990s (for a survey, see ACEMOGLU, 2002). In this paper, I apply and extend the framework used in KATZ and MURPHY (1992), AUTOR, KATZ, and KRUEGER (1998), and ACEMOGLU (2003) in order to describe wage effects of relative demand and supply changes in the Swiss labour market. In order to account for the specificity of Swiss apprenticeship training, I distinguish between the higher and the lower end of the skill spectrum, where apprenticeship training is defined as the boundary between these spectra. In addition, the degree of relative wage rigidity and the effect of immigrants on relative wages are simulated.

4.1 Analytical Framework

Following KATZ and MURPHY (1992), AUTOR, KATZ and KRUEGER (1998) and ACEMOGLU (2003), I take the constant elasticity of substitution (CES) production function as a modeling framework. In this model, the production of output Y is undertaken using high- (H) and low-skilled (L) labour as the two major inputs.⁷ Technology is subsumed under the factor-augmenting terms A_h and A_l , respectively:

$$Y_t = [(A_{lt}L_t)^\rho + (A_{ht}H_t)^\rho]^{1/\rho}.$$

t is a time indicator. Assuming firms are on their relative demand curve, the relative demand and supply for skills are identified. Denoting the demanded

⁷ Alternatively, one may view Y as a labour composite which is part of another production function that also contains capital (*cf.* HECKMAN, LOCHNER, and TABER, 1998, p. 16). An elasticity of substitution of 1 between capital and this aggregate labour composite (*cf.* HECKMAN, LOCHNER, and TABER, 1998, pp. 25 f.) justifies ignoring capital and so I follow this procedure as KATZ and MURPHY (1992), AUTOR, KATZ and KRUEGER (1998), and ACEMOGLU (2003) do.

(employed) quantities of high- and low-skilled labour by N_h and N_p , respectively, the relative demand index,

$$\ln\left(\frac{A_{ht}}{A_{lt}}\right)^{\sigma-1} = \sigma \ln\left(\frac{W_{ht}}{W_{lt}}\right) + \ln\left(\frac{N_{ht}}{N_{lt}}\right) \quad (1)$$

can be identified (and estimated) from this production function by noting that the implicit relative demand function is given by

$$\ln\left(\frac{W_{ht}}{W_{lt}}\right) = \left(\frac{1}{\sigma}\right) \left[\ln\left(\frac{A_{ht}}{A_{lt}}\right)^{\sigma-1} - \ln\left(\frac{N_{ht}}{N_{lt}}\right) \right] \quad (1)^*$$

and by assuming the elasticity of substitution $\sigma = 1/(1 - \rho)$ to be 1.4, which represents the consensus view in the literature that σ is between 1 and 2. This range is derived in Freeman's (1986, p. 366) survey, but also more recent estimates by Katz and Murphy (1992, p. 72), Heckman, Lochner, and Taber (1998, p. 26) and Card and Lemieux (2001, p. 734) find elasticities of 1.4, 1.441, and of between 1.1 and 1.6, respectively. Consequently, AUTOR, KATZ and KRUEGER (1998) and ACEMOGLU (2003) use the value of 1.4 for their simulations.

Although this evidence is mostly from the U.S., ANGRIST's (1995) estimates for the West Bank and the Gaza Strip imply an elasticity of substitution of a similar order, *viz.* 1.9 (derived as $1/(0.25+0.28)$ from ANGRIST's, 1995, p. 1080, estimates). The OECD estimate of 1.1 by MANACORDA and PETRONGOLO (1999, p. 191) is based on different definitions of 'skilled' versus 'unskilled', as can be seen from the data appendix in their article ('skilled' here encloses qualifications significantly below college degree in Germany, like apprenticeship, for example). It is remarkable that despite different definitions, their estimate for a broad range of OECD countries is not too dissimilar from other estimates, either. Therefore, I use an elasticity of 1.4 for both simulations at the higher and the lower end of the skill spectrum.

Models of endogenous technology adoption, like those in ACEMOGLU (2002; 2003) or KOENIGER (2004), suggest that the skill distribution itself as well as labour market institutions like minimum wages may affect relative skill demand and elasticities of substitution differentially across countries. Therefore, I will discuss the robustness of the results below to assumptions of 1 and 2 as elasticities of substitution: On the one hand, a more equal skill distribution in Switzerland may imply a higher elasticity of substitution. On the other hand, the

specialisation entailed by the Swiss apprenticeship training may lead to a lower elasticity of substitution between skill groups in Switzerland than in the U.S.⁸ Minimum wages are less likely to play a role in either country, as Switzerland has no minimum wage and mostly decentralized collective bargaining and the minimum wage in the U.S. is rather low.

In order to create a benchmark for the simulation of wage rigidities, I invoke the assumption that relative supply is inelastic and *changes* in relative supply equal *changes* in the relative population of the two skill groups, $\ln(S_{ht}/S_{lt})$.⁹ Although this assumption may seem strong, it is plausible for a simulation exercise, as it only refers to *changes* instead of absolute ratios. Effectively, I impose in this section that if the relative number of people with high skills increases by 10 percent in the population, the relative labour supply of high-skilled labour will also increase by 10 percent.

Within this modeling framework, I simulate the demand effect on the relative wage, the supply effect on the relative wage and the ‘market relative wage’ that equates relative demand to relative supply changes. Equations (2) to (4) report formulae for these three variables, respectively.

$$\ln\left(\frac{\widetilde{W}_{ht}}{W_{lt}}\right)_{\text{Demand}} = \left(\frac{1}{\sigma}\right) \left[\ln\left(\frac{A_{ht}}{A_{lt}}\right)^{\sigma-1} - \ln\left(\frac{N_{ht_0}}{N_{lt_0}}\right) \right] \quad (2)$$

$$\ln\left(\frac{\widetilde{W}_{ht}}{W_{lt}}\right)_{\text{Supply}} = \left(\frac{1}{\sigma}\right) \left[\ln\left(\frac{A_{ht_0}}{A_{lt_0}}\right)^{\sigma-1} - \ln\left(\frac{S_{ht}}{S_{lt}}\right) \right] - \underbrace{\left(\frac{1}{\sigma}\right) \left[\ln\left(\frac{N_{ht_0}}{N_{lt_0}}\right) - \ln\left(\frac{S_{ht_0}}{S_{lt_0}}\right) \right]}_{\text{correction term}} \quad (3)$$

$$\ln\left(\frac{\widetilde{W}_{ht}}{W_{lt}}\right)_{\text{Market}} = \left(\frac{1}{\sigma}\right) \left[\ln\left(\frac{A_{ht}}{A_{lt}}\right)^{\sigma-1} - \ln\left(\frac{S_{ht}}{S_{lt}}\right) \right] - \underbrace{\left(\frac{1}{\sigma}\right) \left[\ln\left(\frac{N_{ht_0}}{N_{lt_0}}\right) - \ln\left(\frac{S_{ht_0}}{S_{lt_0}}\right) \right]}_{\text{correction term}} \quad (4)$$

8 I thank an anonymous referee for pointing this out.

9 This is an adaptation of the framework by KATZ and MURPHY (1992), AUTOR, KATZ and KRUEGER (1998), and ACEMOGLU (2003), in order to gauge the extent of relative wage rigidity.

In equation (2), the relative demand index $\ln(A_{ht}/A_{lt})^{\sigma-1}$ drives wage changes, whereas relative employment is held constant at the base year t_0 (here 1991), $\ln(N_{ht_0}/N_{lt_0})$, such that the simulated relative wage corresponds to the pure relative demand effect on the relative wage. In equation (3), the relative demand index is held constant at its base year t_0 (here 1991) level and the simulation is driven by relative supply (population) changes. The second term {bracketed as ‘correction term’} guarantees that in the base year, the observed and the simulated relative wages are equal. This guarantees that only *changes* in relative population are used to proxy *changes* in relative supply. Equation (4) simulates the ‘market relative wage’ by calculating the wage necessary to accommodate relative demand and supply changes (*cf.* the implicit relative demand function (1)*). The same ‘correction term’ as in equation (3) is subtracted to equate the ‘market relative wage’ during the base year $t_0 = 1991$ to the observed wage in that year.

As a third influence on relative wages (apart from relative demand and supply), I simulate changes in relative wage rigidity during the observation period. Relative wage rigidity, RWR_t , is defined as the difference between the observed relative wage and the ‘market relative wage’:

$$RWR_t \equiv \ln\left(\frac{W_{ht}}{W_{lt}}\right) - \ln\left(\frac{\widetilde{W}_{ht}}{W_{lt}}\right)_{\text{Market}} \quad (5)$$

and is equal to zero in the base period t_0 by definition. It can be shown by straightforward algebraic reformulation that

$$RWR_t = \left(-\frac{1}{\sigma}\right) \left[\ln\left(\frac{N_{ht}}{S_{ht}}\right) - \ln\left(\frac{N_{lt}}{S_{lt}}\right) \right] + \underbrace{\left(\frac{1}{\sigma}\right) \left[\ln\left(\frac{N_{ht_0}}{N_{lt_0}}\right) - \ln\left(\frac{S_{ht_0}}{S_{lt_0}}\right) \right]}_{\text{correction term}}. \quad (6)$$

Hence, within this framework, the relative wage rigidity indicator is simply a function of the observed relative employment-population ratios of high- versus low-skilled labour plus a constant ‘correction term’ (which sets RWR equal to zero in the base period, $t_0 = 1991$).

The change in (observed) relative wages between the base period $t_0 = 1991$ and year t can thus be decomposed into the change in the supply effect on relative wages, the change in the demand effect on relative wages and the relative wage rigidity indicator as in equation (7):

$$\Delta_{t_0}^t \ln \left(\frac{W_h}{W_l} \right) = \Delta_{t_0}^t \ln \left(\frac{\widetilde{W}_h}{\widetilde{W}_l} \right)_{\text{Supply}} + \Delta_{t_0}^t \ln \left(\frac{\widetilde{W}_h}{\widetilde{W}_l} \right)_{\text{Demand}} + RWR_t \quad (7)$$

In analogy to the supply effect simulation of equation (3), the effect of changes in immigrant relative labour supply can be estimated as follows:

$$\begin{aligned} \Delta_{t_0}^t \ln \left(\frac{\widetilde{W}_h}{\widetilde{W}_l} \right)_{\text{Immigrant Supply}} &= \left(\frac{1}{\sigma} \right) \left[\ln \left(\frac{A_{ht_0}}{A_{lt_0}} \right)^{\sigma-1} - \ln \left(\frac{S_{ht}}{S_{lt}} \right) \right] \\ &\quad - \left(\frac{1}{\sigma} \right) \left[\ln \left(\frac{A_{ht_0}}{A_{lt_0}} \right)^{\sigma-1} - \ln \left(\frac{SN_{ht}}{SN_{lt}} \right) \right] \\ &\quad + \underbrace{\left(\frac{1}{\sigma} \right) \left[\ln \left(\frac{S_{ht}}{S_{lt}} \right) - \ln \left(\frac{SN_{ht}}{SN_{lt}} \right) \right]}_{\text{correction term}} \\ &= \left(\frac{1}{\sigma} \right) \left[-\ln \left(\frac{S_{ht}}{S_{lt}} \right) + \ln \left(\frac{SN_{ht}}{SN_{lt}} \right) \right] + \underbrace{\left(\frac{1}{\sigma} \right) \left[\ln \left(\frac{S_{ht_0}}{S_{lt_0}} \right) - \ln \left(\frac{SN_{ht_0}}{SN_{lt_0}} \right) \right]}_{\text{correction term}} \end{aligned} \quad (8)$$

where $\ln(SN_{ht}/SN_{lt})$ denotes native relative labour supply as opposed to total relative labour supply in the economy, $\ln(S_{ht}/S_{lt})$. The ‘correction term’ guarantees that the immigrant relative labour supply effect is defined to be zero at the base period. In the simulations below, I will estimate the relative wage effect of different groups of immigrants, so that ‘natives’ will refer to all residents of Switzerland not included in the corresponding immigrant definition.

This simple macroeconomic framework (as established in the literature) is set up as a two-skill model to make it tractable. However, I will use this framework to investigate the Swiss skill distribution in two different ranges of the skill spectrum. In analogy to the papers by KATZ and MURPHY (1992), AUTOR, KATZ, and KRUEGER (1998), and ACEMOGLU (2003), I compare high- versus low-skilled workers. At the ‘higher end of the skill spectrum’, I define high-skilled workers to be college or university graduates, whereas low-skilled workers are defined to be persons with an apprenticeship certificate. However, I also give special attention to the comparison of workers with apprenticeship training and those who did not even receive this type of education. The latter comparison is referred

to as the ‘lower end of the skill spectrum’. The distinction of what happened at the higher versus the lower end of the skill spectrum is particularly interesting because it potentially highlights apprenticeship training as the key specificity of the Swiss education system.

On the basis of the socio-economic characteristics described in the previous section, I define 100 age-education-gender-region cells (by five age, five education, two gender and two regional groups). For each cell, I calculate the median (or the mean, the results are robust with respect to this choice) wage and the size of the cell in terms of number of persons (using the SLFS sample weights). In order to calculate a wage series for *university/college* graduates, for example, I average the wage over all cells referring to *university/college* graduates using the average size of each cell in the sample period as a weight. Similarly, in order to obtain a supply series for *e.g. university/college* graduates, I average the size of all corresponding cells using the average wage of each cell as a weight (as in KATZ and MURPHY, 1992). This weighted averaging procedure for the cell medians (or means) is effectively a nonparametric way to control for changes in the age, gender and region structures of the skill groups in question.¹⁰

For the higher end of the skill spectrum, the relative supply of high (*university/college*) over low (*apprenticeship*) skills is then calculated as the ratio of *university/college* over *apprenticeship* ‘equivalents’ as in AUTOR, KATZ, and KRUEGER (1998) and ACEMOGLU (2003): I simulate *higher vocational* and *advanced high school* degree holders to entail 0.6 and 0.2 times the human capital of *university/college* degree holders and add them with these shares to this group in order to obtain a ‘high-skill equivalent’ series. To get a ‘low-skill equivalent’ series, I add 0.4 and 0.8 times the number of *higher vocational* and *advanced high school* degree holders to the *apprenticeship* certificate holders plus 0.5 times the number of workers with *mandatory education or less*. Relative wage and supply series are then obtained by taking the ratio of high- over low-skill wages and ‘equivalent workers’, respectively. For the lower end of the skill spectrum, the ‘high-skill equivalent’ (*i.e.* apprenticeship equivalent) series is obtained by adding 0.2, 0.5 and 0.8 times the number of *university/college* graduates, *higher vocational* and *advanced high school* degree holders to the *apprenticeship* certificate holders,

10 This procedure is nonparametric in the sense that changes, for example, in the regional structure over time are measured at the *cell* level, weighted by the average cell wage. A parametric procedure would not discriminate between changes in the regional structure occurring two different age-gender-education cells. For nonparametric analyses of Swiss age-income and age-inequality profiles in different contexts see GERFIN (1994) and ZÜRCHER (2004), respectively.

respectively. Although one may challenge this procedure (which is also applied in the previous literature) of imputing skill equivalents, any changes within a plausible range to the imputation shares I chose for calculating the skill equivalents do not make a qualitative difference to my results. The reason is that the educational groups higher than apprenticeship used to impute the apprenticeship equivalent are too small in share for reasonable adjustments to the imputation shares to make much difference.¹¹

4.2 Relative Demand, Supply, and Wage Rigidity

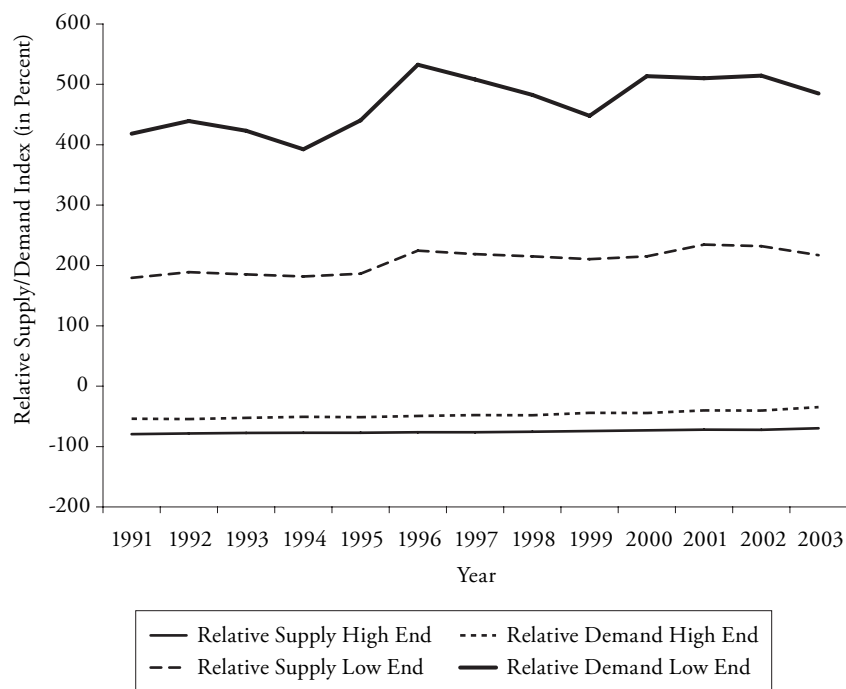
Figure 2 displays the relative demand and supply indices, *i.e.* $\ln(A_{ht}/A_{lt})^{\sigma-1}$ and $\ln(S_{ht}/S_{lt})$, for Switzerland between 1991 and 2003 for the higher and the lower end of the skill spectrum.¹² Both relative demand and supply for skills are higher at the lower end of the skill spectrum. This is explained by the fact that *university/college graduates* are fewer in number compared to *apprenticeship graduates* than *apprenticeship graduates* are compared to *workers without even apprenticeship training*.

The first thing to observe is that both the relative demand and the relative supply of high-skilled over low-skilled labour increased considerably during the observation period, especially at the higher end of the skill spectrum. The changes at the higher end of the skill spectrum during the decade with first rising

11 The robustness checks concerning these skill imputations yield qualitatively similar results even for rather extreme imputations: At the one extreme, I assume that *higher vocational* and *advanced high school* degrees entail 0.25 and 0 times the human capital and at the other extreme 0.75 and 0.25 times the human capital of *university/college* degrees. At the higher end of the skill spectrum, I also assume that *higher vocational*, *advanced high school* and *mandatory education* degrees entail 0.75, 1, and 0 times the human capital of apprenticeship certificates at the one and 0.25, 0.75, and 0.75 times the human capital of apprenticeship certificates at the other extreme, respectively. A similar robustness check has been undertaken at the lower end of the skill spectrum: There I assume that *university/college*, *higher vocational* and *advanced high school* degrees at the one extreme entail 0, 0.25, and 0.5 times and at the other extreme entail 0.5, 0.75 and 1 times the human capital of *apprenticeship* certificates, respectively. Even at these extremes, there are no major changes to the main story. In addition, the results on statistical significance of changes in the series are almost identical. These alternative simulations together with bootstrapped confidence intervals are available from the author upon request.

12 The underlying numbers of this and the following figures are given in the tables of the Internet Appendix. All subsequent estimates are based on the assumption that the elasticity of substitution is 1.4. As discussed above, this can be regarded as a consensus estimate in the literature. I have also carried out robustness checks for elasticities of substitution 1 and 2: There are no major changes to the results of this paper. See also the short discussion in the text below.

Figure 2: Relative Supply and Demand Indices at the Higher and Lower End of the Skill Spectrum



Note: These simulations assume $\sigma = 1.4$. The corresponding tables can be found in the Internet Appendix. Statistical significance is assessed at the 10 percent level, based on bootstrapped confidence intervals. The applied bootstrap carries out 1000 replications of the whole estimation process, *i.e.* from the calculation of cell medians, to aggregations and subsequent simulations. For the following series and years, the figures in the series are significantly different from the value in 1991: *Relative Supply High End*: 1992–2003; *Relative Demand High End*: 1997, 1999–2003; *Relative Supply Low End*: 1996–2003; *Relative Demand Low End*: 1996–2003.

Source: Swiss Labour Force Survey (SLFS): own calculations.

and then falling aggregate unemployment, 1991 to 2001, are 0.26 and 0.32 log points for relative demand and supply, respectively (if one were to take cell mean instead of median wages as a measure, the corresponding figures would be identical).^{13, 14} In the two years up to 2003 when unemployment rose again, the trend of rising relative supply and demand for skills continued. Indeed, Figure 2 supports the hypothesis that at least at the higher end of the skill spectrum, both

rising demand and supply for skills are a continuous process that is unrelated to the business cycle. Such a statement cannot be made for the lower end of the skill spectrum, where the increase in both relative demand and supply for skills are largely concentrated on the period 1994 to 1996. Both the increase in the relative demand and the relative supply of skills is statistically significant. This is true both at the higher and at the lower end of the skill spectrum.¹⁵

I now consider how demand and supply changes translated into changes in relative wages. As can be seen from Figure 3 and Figure 4, the actual – ‘observed’ – relative wages fell slightly during the observation period, but this fall is not statistically significant (except between 1991 and 2000 at the higher end of the skill spectrum). In the light of rising and falling unemployment in Switzerland during the 1990s, the question arises whether the fairly constant relative wage has been justified by relative demand and supply developments or whether it is the result of a relative wage rigidity.

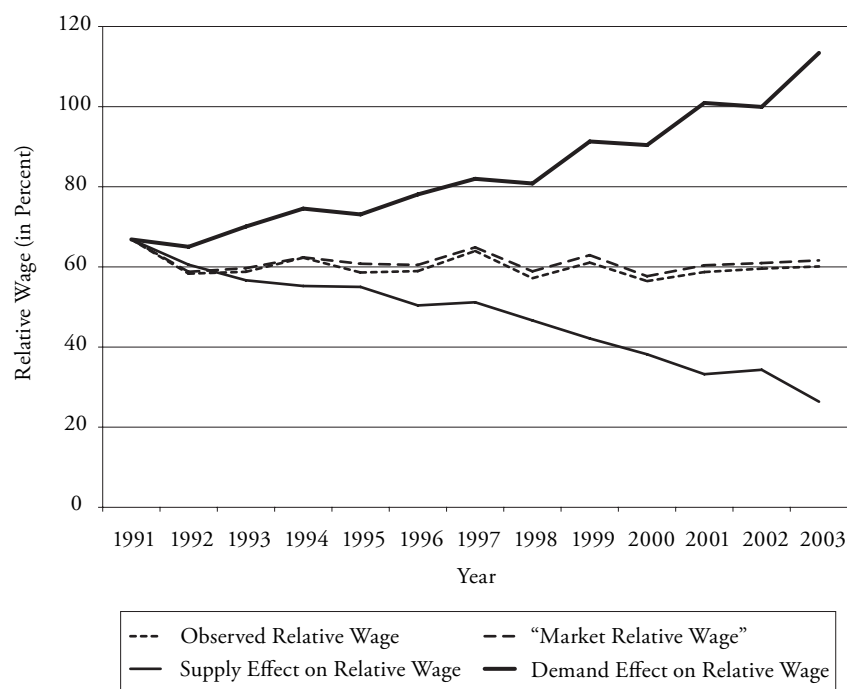
Considering the higher end of the skill spectrum first, Figure 3 displays the effects of demand and supply changes on the relative wage, the ‘market’ relative wage resulting from the combination of relative demand and supply changes, as well as the relative wage rigidity indicator (RWR), which is the difference between the observed relative wage and the market relative wage (*cf.* equation (5)). As shown in equation (7), relative demand, supply and wage rigidity together explain changes in observed relative wages. In Figure 3, relative wage rigidity is simply the gap between the observed and the ‘market’ relative wage. As can readily be seen from the graph, both the demand and the supply effect on relative wages have been remarkably large: Had there been no increase in the relative supply of university or college graduates in Switzerland (*e.g.* through the introduction of polytechnics/*Fachhochschulen*), the relative wage between workers with higher education and those with apprenticeship training would have risen by 0.25 log points due to relative demand changes (this figure is significantly different

13 In the main text of the paper, results are reported in log points, as common in large parts of the literature. In the graphs, the *y*-axis reports the corresponding percentages. The tables in the Internet Appendix also report everything in log points.

14 The increase in relative supply of 0.26 log points in Switzerland for both periods 1991–2000 and 1992–2001 is comparable to ACEMOGLU’s (2003) results for the US during a period of the same length, 1988 and 1997: Table 1b in ACEMOGLU (2003) suggests a relative skill supply increase of 0.23 log points [$= \log(0.355) - \log(0.281)$].

15 Statistical significance is assessed at the 10 percent level based on a nonparametric bootstrap using the statistical software *stata*. The applied bootstrap carries out 1000 replications of the whole estimation process, *i.e.* from the calculation of cell medians, to aggregations and subsequent simulations.

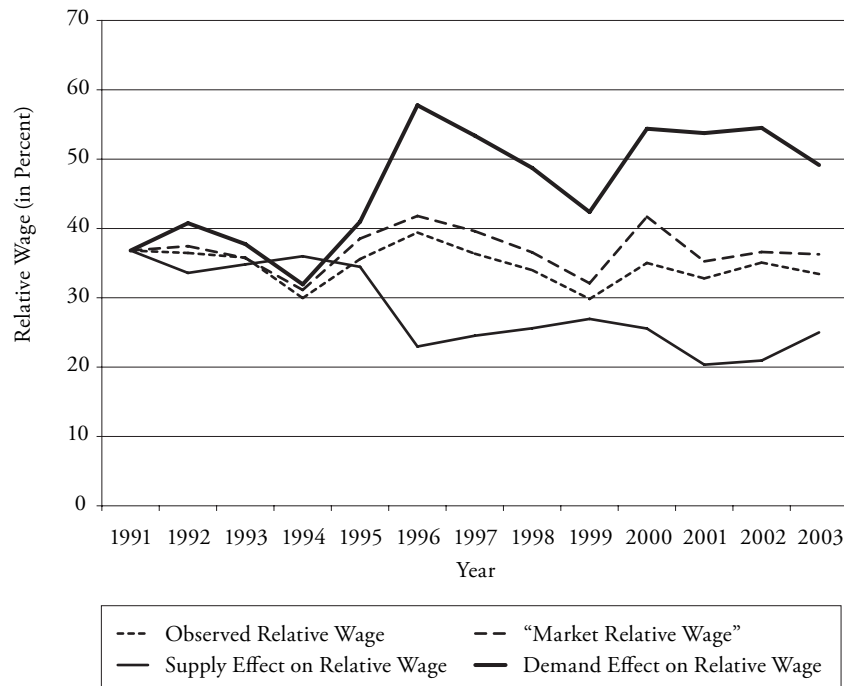
Figure 3: Constant Demand and 'Market' Relative Wage Simulations at the Higher End of the Skill Spectrum



Note: These simulations assume $\sigma = 1.4$. The corresponding tables can be found in the Internet Appendix. Statistical significance is assessed at the 10 percent level, based on bootstrapped confidence intervals. The applied bootstrap carries out 1000 replications of the whole estimation process, *i.e.* from the calculation of cell medians, to aggregations and subsequent simulations. For the following series and years, the figures in the series are significantly different from the value in 1991: *Observed Relative Wage*: 2000; *Market Relative Wage*: –; *Supply Effect on Relative Wage*: 1992–2003; *Demand Effect on Relative Wage*: 1997; 1999–2003. The *Relative Wage Rigidity Indicator*, *RWR*, *i.e.* the difference between the *Observed* and the *Market Relative Wage*, is statistically different from zero only in 1995.

Source: Swiss Labour Force Survey (SLFS): own calculations.

Figure 4: Constant Demand and 'Market' Relative Wage Simulations at the Lower End of the Skill Spectrum



Note: These simulations assume $\sigma = 1.4$. The corresponding tables can be found in the Internet Appendix. Statistical significance is assessed at the 10 percent level, based on bootstrapped confidence intervals. The applied bootstrap carries out 1000 replications of the whole estimation process, *i.e.* from the calculation of cell medians, to aggregations and subsequent simulations. For the following series and years, the figures in the series are significantly different from the value in 1991: *Observed Relative Wage*: –; *Market Relative Wage*: –; *Supply Effect on Relative Wage*: 1996–2003; *Demand Effect on Relative Wage*: 1996–1998; 2000–2003. The *Relative Wage Rigidity Indicator, RWR*, *i.e.* the difference between the *Observed* and the *Market Relative Wage*, is statistically different from zero only in 2000 and marginally significant in 2003.

Source: Swiss Labour Force Survey (SLFS): own calculations.

from zero). However, the increase in the relative supply of workers with higher education was so large that – had there been no concomitant increase in relative demand – the relative wage would have fallen by 0.28 log points (this figure is also significantly different from zero). The combined effects of relative demand and relative supply changes can be seen in the ‘market relative wage’ series, which displays no changes that are statistically significant. Hence, as demonstrated in Figure 3, relative demand and relative supply changes neutralised each other at the higher end of the Swiss skill spectrum during the period 1991 to 2003. The point estimates of the relative wage rigidity indicator (RWR) are small at -0.01 log points, which means that low-skilled wages are about 1 percent too high in relation to high-skilled wages. However, this small number is not statistically significant (except for the year 1995).

What about the lower end of the skill spectrum (workers with apprenticeship qualification versus those without apprenticeship)? The estimation and simulation results are displayed in Figure 4. It is shown that the development of the estimates over time is less steady and more erratic compared to the results for the higher end of the skill spectrum. This is partly due to the somewhat lower sample size on which the estimates are based. Nevertheless, the ‘big picture’ that relative demand increased significantly, but that (statistically significant) relative supply increases counterbalanced this development, also holds at the lower end of the skill spectrum. Just as in the results for the higher end of the skill spectrum, there are no significant changes in either the observed or the ‘market’ relative wage. It is interesting to observe that the relative wage rigidity indicator (RWR) is larger here (-0.02 log points in most years) than for the higher end of the skill spectrum. However, only the figures for the years 2000 and 2003 are statistically relevant, the former is significant, the latter is marginally insignificant (see also the tables in the Internet Appendix).

Although only tentative, the results on relative wage rigidity at the lower end of the skill spectrum are supported by evidence from collectively bargained wage increases: A study by the Federal Statistical Office (*Bundesamt für Statistik*, 2002) shows that between 1999 and 2001, bargained wages for workers without even apprenticeship training rose by seven percent on average, whereas they only rose by three percent on average for more qualified skill groups. In addition, a microeconomic study by PUHANI (2003) finds robust evidence for a relative wage rigidity for workers without apprenticeship training (and only for this educational group) in Switzerland using data from 1991 up to 2001.

Note that it was assumed here that the elasticity of substitution between skill groups is the same both at the higher and at the lower end of the skill spectrum. Yet if one presumes that the elasticity of substitution between *apprenticeship*

graduates and those *without apprenticeship* is lower than the corresponding elasticity between *university/college* and *apprenticeship graduates*, the relative wage rigidity at the lower end of the skill spectrum becomes even larger compared to the one at the higher end: Changing the imposed elasticity of substitution from say 1.4 to 1 or 2 simply alters the relative supply effect on relative wages or the relative wage rigidity indicator by a fixed factor, namely by $1.4/1 = 1.4$ or $1.4/2 = 0.7$. This can directly be seen from equations (3) and (6). However, robustness checks show that for all results in this paper, the qualitative findings remain unchanged when varying the elasticity of substitution between 1 and 2. This is also true for the statistical significance of the results.

One reason for the insignificance of most relative wage rigidity estimates may be the nonparametric components of the analysis (*cf.* section 4.1), which create larger standard errors than models with more parametric restrictions. Hence, although I interpret the results on relative wage rigidity with caution, I argue that the evidence is at least suggestive.

The view that emerges from these results is thus that relative supply of skill changes in Switzerland were adequate for neutralising the (continuously) rising increases in the relative demand for skills. As a result, no *major* changes in the relative wages between skill groups were necessary.

Given the fact that about a fifth of the Swiss labour force is foreign, the question arises in which way immigration policy played a role in balancing relative supply with relative demand changes. Therefore, the following subsection investigates the impact of various immigrant groups on relative wages Switzerland.

4.3 Relative Wage Simulations for Alternative Immigrant Regimes

Figure 5 and Figure 6 display the simulated effects of changes in immigrant labour supply on relative wages for the higher and lower skill spectrum, respectively. Four different simulations are carried out according to the formula given in equation (8). They refer to (a) immigrants with an annual (B) work permit (*cf.* Section 2 on Swiss immigrant permits), (b) immigrants with either a B or C (green card) permit, (c) only 'low-skilled' immigrants with a B permit, and (d) 'low-skilled' immigrants with either a B or a C permit. Note that immigrants with a B or C permit comprise virtually the whole immigrant population resident in Switzerland (excluded are frontier workers who live abroad and seasonal workers who are not officially residents of Switzerland, either; these groups as well as asylum seekers are not included in the Swiss Labour Force Survey). The four simulations are motivated by the fact that annual work permits can be used to fine-tune immigrant labour supply. Simulations (a) and (c) thus show

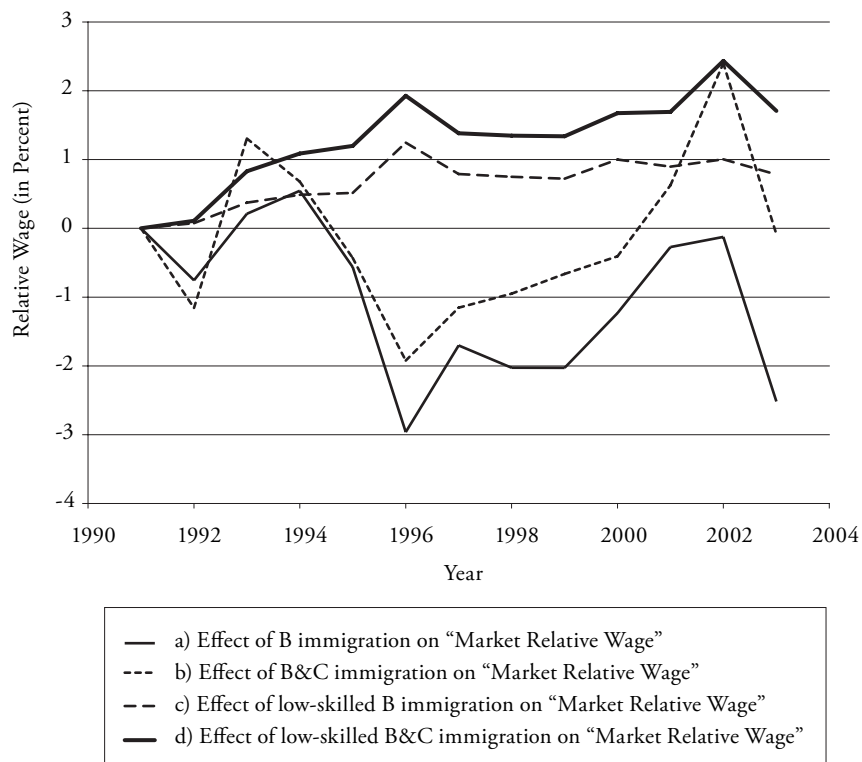
the effects of changes in immigration with a B visa and the effects of changes in only low-skilled immigration with a B visa, respectively. Both simulations may be regarded as the effects of contemporary politics in the 1990s. On the other hand, simulations concerning both B and C visa immigrants reflect more the effects of past immigration policies, because residents who hold a B visa for – depending on their nationality – five or ten years (virtually) obtain the right to a C (green card) permit. Hence, once immigrants are accepted with a B visa, most of them can be expected to obtain a green card in the medium to long run, according to Swiss law.¹⁶ Therefore, changes in C immigrants in the 1990s are to a large extent effected by Swiss immigration policies in the 1980s, *i.e.* before the economic crisis. Simulations (b) and (d) thus mostly show the effects of past immigration policies, as the shares of B and C immigrants in the working age population were 3 and 16 percent, respectively (own calculations based on the 1991 SLFS; the figures for 2003 are 6 and 16 percent, respectively).

So what effect did changes in these four immigrant groups have on the relative wages in Switzerland during the observation period? Figure 5 and Figure 6 exhibit rather different pictures for the higher and the lower end of the skill spectrum, respectively.¹⁷ Point estimates for the low-skilled immigrants in Figure 5 suggest that the relative wages of high- versus low-skilled workers were pushed up by about 1 and 2 percent in simulations (c) and (d) respectively. This means that the low-skill content was increasing faster among the C than the B immigrants. Bootstrapped confidence intervals show that the simulated increase in the relative wage is statistically significant, although the point estimates are small. If one considers the effects of changes in all B or all B and C immigrants on relative wages at the higher end of the skill spectrum (simulations (a) and (b)), point estimates suggest that immigration policies successfully decreased the relative wage

16 Most European nationals in fact have by state treaty a right to obtain a green card after five years as B immigrants in Switzerland. Most non-European nationals do not have that right, but the rule is that they can apply for a green card after ten years in the country as B immigrants.

17 These simulations assume that immigrants and natives are perfect substitutes. Given that immigrants answer the same education questions as natives, those without even apprenticeship training are correctly classified as very low skilled. Hence, part of the problem is already solved by the fact that the education variable measures whether somebody has at least (Swiss) apprenticeship skills. In addition, 63 percent of working-age population immigrants in the 2003 sample have a western European passport. Hence, it can be expected that the largest part of immigrants are indeed very close substitutes to Swiss workers. Finally, of those who do not have a western European passport, 40 percent of the 2003 sample entered the country at age 20 or younger, so that they can be expected to have received some sort of Swiss education.

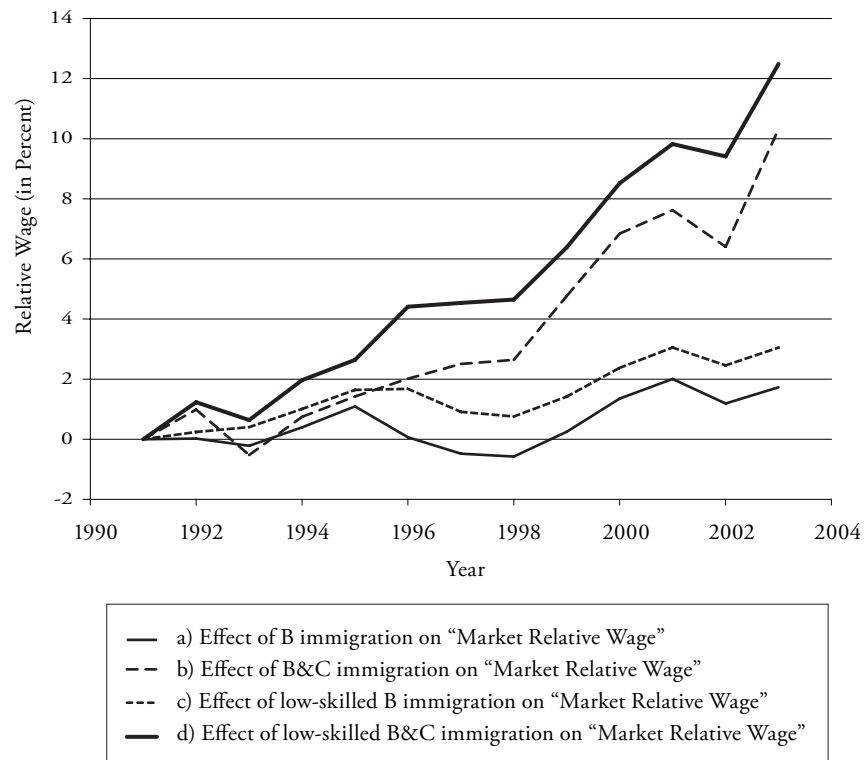
Figure 5: Effects of Migration on Relative Wages – Higher End of the Skill Spectrum



Note: These simulations assume $\sigma = 1.4$. The corresponding tables can be found in the Internet Appendix. Statistical significance is assessed at the 10 percent level, based on bootstrapped confidence intervals. The applied bootstrap carries out 1000 replications of the whole estimation process, *i.e.* from the calculation of cell medians, to aggregations and subsequent simulations. For the following series and years, the series are significantly different from zero: *Effect of B Immigration on Market Relative Wage*: 1996, 1997, 1999, 2003; *Effect of B and C Immigration on Market Relative Wage*: 2002; *Effect of Low-Skilled B Immigration on Market Relative Wage*: 1993–2003; *Effect of Low-Skilled B and C Immigration on Market Relative Wage*: 1993–2003.

Source: Swiss Labour Force Survey (SLFS): own calculations.

Figure 6: Effects of Migration on Relative Wages – Lower End of the Skill Spectrum



Note: These simulations assume $\sigma = 1.4$. The corresponding tables can be found in the Internet Appendix. Statistical significance is assessed at the 10 percent level, based on bootstrapped confidence intervals. The applied bootstrap carries out 1000 replications of the whole estimation process, *i.e.* from the calculation of cell medians, to aggregations and subsequent simulations. For the following series and years, the series are significantly different from zero: *Effect of B Immigration on Market Relative Wage:* 1995, 2001, 2003; *Effect of B and C Immigration on Market Relative Wage:* 1999–2003; *Effect of Low-Skilled B Immigration on Market Relative Wage:* 1995–1996, 1999–2003; *Effect of Low-Skilled B and C Immigration on Market Relative Wage:* 1995–2003.

Source: Swiss Labour Force Survey (SLFS): own calculations.

of high- versus low-skilled workers when Swiss unemployment peaked around 1995–1997. This effect is more pronounced for B immigrants for whom short-term fine-tuning is possible. Indeed, the bootstrap results show that the negative impact on relative wages is only significant for simulation a) that refers to B immigrants. After the fall in unemployment between 1997 and 2001, unemployment increased again up to 2003. Again, immigration policy at the higher end of the skill spectrum reacted by changing the skill mix of B immigrants in 2003 such as to compress the relative wages of high- versus low-skilled immigrants (this effect is statistically significant).

Surprisingly, this did not occur at the lower end of the skill spectrum (*cf.* Figure 6). Although point estimates exhibit temporary decreases in the simulated relative wages for all B and low-skilled B immigrants (simulations (a) and (c)), the effect itself is mostly positive and significant in several years (in 1995, 2001 and 2003 in simulation (a) and in 1995, 1996 and from 1999 to 2003 in simulation (c)). What is most striking are the large positive effects of B and C immigrants on the relative wage in simulations (b) and (d). The point estimates exhibit an upward trend reaching 10 and 12 percent, respectively. Given the results for simulations (a) and (c) on B immigrants, this large effect of changes in B and C immigrants must be driven by a deteriorating relative skill content among C immigrants. Closer inspection of the microdata (available on request) shows that C immigrants are far more likely to have an educational level below apprenticeship than Swiss people with 44 versus 20 percent in 1991, respectively. During the course of the observation period, this share remained roughly constant for C immigrants, whereas it decreased down to 16 percent for natives in 2003. This development is the driving force for the distinct simulation results at the lower end of the skill spectrum: Even though the authorities managed to keep the skill mix of B immigrants in check during the crisis of the 1990s, such as to not put further pressure on low-skilled versus high-skilled wages, immigrants from previous periods receiving C permits contributed to a statistically and economically significant pressure on relative wages of the lowest skill group, namely workers without apprenticeship training.

5. Conclusions

This paper has investigated relative demand, supply and relative wage rigidity as three underlying forces driving relative wages of high- versus low-skilled workers in Switzerland. I have distinguished between the higher end of the skill spectrum ranging from *higher education* to *apprenticeship training* and the lower end of the skill spectrum ranging from *apprenticeship training* to *mandatory school or less*.

At the lower end of the skill spectrum, there is some tentative evidence for a small degree of relative wage rigidity that might have caused some unemployment. However, the main factor keeping relative wages of high- versus low-skilled workers roughly constant in Switzerland since the beginning of the 1990s were relative supply changes that counterbalanced relative demand changes. Relative wage rigidity has at best been playing a secondary role.

In the light of international evidence on relative wage or employment increases for high- versus low-skilled workers, these results are consistent with a view stressing the specificity of apprenticeship training in the Swiss education system. If one compares ACEMOGLU's (2003) results from the U.S. (mentioned in footnote 13) with my simulations, then relative supply of skill changes were about the same at the higher end of the skill spectrum in Switzerland and the U.S. However, relative demand changes must have been smaller in Switzerland than in the U.S. This is most likely due to difference in the types of education defined as low-skill (apprenticeship versus high-school graduates). If this comparison is taken at face value, Swiss apprenticeship training entails skills for which relative demand is falling less than for U.S. high school graduates.

Although my analyses reveal increasing demand for skills across the whole skill spectrum, the Swiss education system managed to increase the relative supply of skills both at the higher and the lower end of the skill spectrum such that 'market' relative wages remained constant. This was achieved by increasing both the relative supply of higher education versus apprenticeship training and the relative supply of apprenticeship graduates versus workers with only mandatory schooling. However, probably because wide-spread apprenticeship training is only common in German-speaking countries, large parts of immigrants in Switzerland receiving C permits in the 1990s were not sufficiently trained to match relative demand for skill changes at the lower end of the skill spectrum. Nevertheless, the pressure on relative wages exerted by these immigrants were neutralised by relative skill supply changes among natives. Hence, the popular view that tough Swiss immigration policy helps to keep pressure on relative wages or unemployment low cannot be substantiated in this paper. Instead, the evidence supports Swiss educational policies as meeting changes in relative labour demand for skills. As is well documented in a large number of studies, the U.S. education system failed to do that. Hence wage inequality had to increase in the U.S., but not in Switzerland.

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SUMMARY

Whereas Anglo-Saxon economies have recently experienced a widening wage distribution between skill groups, the Swiss wage structure has remained almost stable. This raises the question whether the Swiss labour market did not experience a decrease in the relative demand for low-skilled workers as the Anglo-Saxon economies or whether it was supply changes that kept the wage distribution between skill groups constant. I show that immigration policy played a negligible role and that the stable wage structure was made possible by adequate increases in the relative supply of skills that neutralised the increasing relative demand. From a policy perspective, my results are supportive of existing supply-side policies aiming to improve the skills of the workforce, like the expansion of higher education.

ZUSAMMENFASSUNG

Während in den angelsächsischen Ländern die Lohndifferentiale zwischen Qualifikationsgruppen in den letzten Jahren gestiegen sind, ist die schweizerische Lohnstruktur nahezu stabil geblieben. Dies wirft die Frage auf, ob der schweizerische Arbeitsmarkt im Gegensatz zu den angelsächsischen Ländern keine relativen Nachfrageschocks für geringqualifizierte Arbeitnehmer erfahren hat oder ob Angebotsveränderungen die Lohndifferentiale zwischen den Qualifikationsgruppen konstant hielten. Es wird gezeigt, dass Einwanderungspolitik eine zu vernachlässigende Rolle gespielt hat und dass die konstanten Lohndifferentiale durch eine angemessene Erhöhung des relativen Angebotes an hochqualifizierten Arbeitskräften möglich wurden, die die steigende relative Nachfrage neutralisierte. Aus wirtschaftspolitischer Sicht unterstützen die Ergebnisse die derzeitige angebotsorientierte Politik, die auf eine Verbesserung der Qualifikation der Arbeitnehmer abzielt, wie z.B. die Erweiterung der Hochschulbildung.

RÉSUMÉ

Les écarts de salaire selon le degré de qualification se sont accentués dans les économies anglo-saxonnes mais sont restés quasiment stables en Suisse. On peut alors se demander si la demande de travail des moins qualifiés n'a pas baissé en Suisse ou si les chocs au niveau de l'offre de travail ont maintenu la distribution des salaires constante entre les différentes qualifications. Dans cette étude, nous

montrons que la politique de l'immigration n'a pas joué de rôle significatif et qu'il a été possible de maintenir la structure salariale constante car l'augmentation de la demande de travail a été compensée par celle de l'offre des qualifiés. D'un point de vue de politique économique, nos résultats soutiennent l'amélioration des qualifications préconisée par la politique actuellement en œuvre.