The Effect of Immigration on Specialisation of the Native Work Force in Switzerland

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Abstract

The Swiss labour market has been significantly affected by immigration during the last decades which led to increasing economic debates about the consequences of immigration.
While many studies examined the effects on wages and mostly did not reveal any big impacts, this thesis focuses on the effect of immigration on native work force specialisation through occupational change to more communication intensive tasks in the tradition of Peri & Sparber (2009).
I will show that immigration forced native workers to pursue more communication and less manual intensive tasks and that this effect increased with the enactment of the Free Movement of Persons Agreement between Switzerland and the European Union in 2002.

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1 Introduction

Immigration played an important role in the economic post-war development of Switzerland, as the share of foreigners in Switzerland's total population rose from 5% in 1950 to more than 20% in recent years.
Therefore the effect of immigration is a broadly discussed topic in Switzerland, as in most advanced economies around the world.

Given the observation of occupational upgrading but still low effects on wages in Switzerland, apart from technological change and the effect of trade and off-shoring, the specialisation of the native work force is discussed as another factor supporting these tendencies and is being broadly discussed in recent literature studies.

This thesis will examine the effects of immigration on specialisation of the native work force in Switzerland, adding to the findings of other studies in European countries and the United States.
Additionally it will examine if the Free Movement of Persons Agreement with the European Union in 2002 had an effect on the magnitude of immigration effects on specialisation of the native work force.

I will give an overview of recent literature findings and explain the patterns of immigration in Switzerland, to put it into the context of other studies and to be able to draw first conclusions about its behaviour.
Following the skill-task model approach of Peri & Sparber (2009), I will examine in a regression analysis whether immigration forces native workers to specialise in more communication intensive occupations. I will separately test two time periods before and after the Free Movement of Persons Agreement with the European Union in 2002 and compare the results and their magnitude.

As Figure 1 is suggesting through the overall increased communication task intensity, I do find significant effects of immigration on native work-

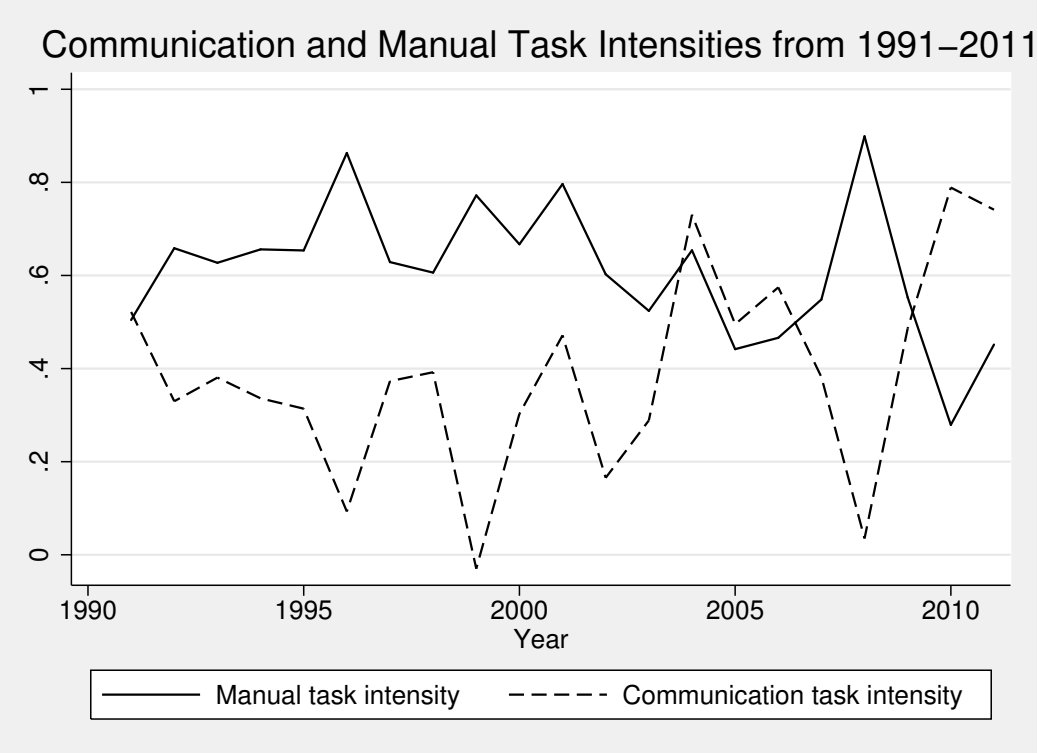

Figure 1: Communication and Manual Task Intensities 1991-2011
Source: Author's calculations on SAKE data from 1991-2011 and recalculated O*NET abilities by Peri & Sparber (2009).
Notes: This graph shows the manual and communication task intensities of native low and medium educated workers within Switzerland evolving over time.

ers with low and medium education by increasing their absolute and relative supply of communication tasks intensity, suggesting that they indeed are forced to specialise in more communication intensive occupations.
The enactment of the Free Movement of Persons Agreement in 2002 led to an increased effect on communication intensity of tasks supplied by the native work force.

I will start giving an overview about related literature and how the skill and task based model was developed in the following section 2. Section 3 will then examine the migration patterns of Switzerland, focusing on the two key figures examining immigrants education and their skills. Section 4 introduces the model of Peri & Sparber (2009), which later on will be

used to empirically test the hypothesis of task specialisation in Switzerland. After describing the relevant datasets and variables in section 5, I will empirically test the assumptions in section 6 with finally giving a conclusion in section 7.

2 Literature Review

The effects of immigration on natives is a broadly discussed topic among economists and also politically relevant. To understand the importance of work force specialisation when examining the effects of immigration, I will first give an overview of related literature, how it evolves over time and how economists came up with a skill and task based model, which tries to explain the work force specialisation. I will then show some results of studies from other countries using the skill-task approach and in the end give some insights, what we would expect from Switzerland.

As a first approach many studies examined the effect of immigration on wages with textbook models of competitive labor markets, which led to different and confusing set of results, mainly clustering around zero (Friedberg & Hunt 1995).

Borjas (2003) then brought up a differentiated approach of measuring the impact of immigration, by accounting for workers education and work experience, clearing up the confusing array of results from previous studies and leading to consistent results, suggesting that immigration has a negative effect on less-educated native workers. Many studies refer to this model as the skill-cell approach based model.

The observation, that in the last decades many highly developed countries experienced an increasing demand for occupations requiring abstract and complex skills together with a decreasing demand in routine and manual ones, did not fit into the simple model of education experience

cells by Borjas (2003) and led to an increased attention by economists.
These tendencies have been documented for the United States by Acemoglu & Autor (2010) and for the European Union by Goos et al. (2009) and Oesch & Rodriguez Menes (2010).

As stated by D'Amuri & Peri (2010) and summarised by Acemoglu & Autor (2010), the main research trying to explain these tendencies focused on two possible explanations: The effect of technology in terms of information and communication technologies increasing the productivity of abstract-complex occupations and substituting for manual and routine ones, and the effect of trade and off-shoring, which allows the reallocation of simple and manual production processes abroad, while not affecting complex occupations.

Those factors probably being the main contributors to the experienced change in specific occupation demands, D'Amuri & Peri (2010) adds to it the specialisation of the native work force as another dimension producing a shift in the supply of tasks.

D'Amuri & Peri (2010) stated the requirement of differences in relative efficiency of skills supply between the two groups, to explain the pattern of average native workers increasingly specialising in complex and abstract production tasks while foreign-born workers mostly staying unchanged or rather move to manual and routine tasks.
Native and foreign-born workers have different comparative advantages and are therefore imperfect substitutes, which was also brought up by Ottaviano & Peri (2006) and confirmed by Ottaviano & Peri (2008).

This approach of work force specialisation is also based on several studies examining the difference between native and foreign-born workers. Their conclusion led to imperfect substitution of native and foreign-born workers within groups of similar observable characteristics, as in this case education-age groups. Native workers are assumed to possess com-

parative advantages in complex-abstract and communication skills while foreign-born workers are relatively more advanced in manual tasks. The imperfect substitution therefore promotes native work force specialisation in terms of occupational change, due to comparative advantages in individual skills and performed tasks (Manacorda et al. 2006, Ottaviano & Peri 2008, Peri & Sparber 2009).

There are several similar studies examining the effects on native work force specialisation. Specialisation for foreign-born workers is mostly defined as specialisation in manual and routine tasks, requiring the use of physical skills, whereas native work force specialisation is mostly defined as specialisation in abstract and complex tasks requiring analytical thinking (D'Amuri & Peri 2010), or in more recent literature communication tasks which require language skills (Peri 2009).

For the United States Peri (2009) is using a task based model with communication and manual skill measurements, finding significant evidence, that immigration forces native workers to specialise in more communication intensive tasks due to their comparative advantages in language skills.

For European countries D'Amuri & Peri (2010) are also using a task based framework with complex-abstract and manual skill definitions, providing empirical evidence that immigration forces the native work force to specialise in occupations requiring more complex-abstract tasks.

Switzerland currently does not have any studies focusing on the effect of immigration on native work force specialisation but the effects on native wages and other occupational effects are documented.

Generally studying the differences of native and foreign-born workers Gerfin & Kaiser (2010) show that these two groups are imperfect substitutes across education and experience groups in Switzerland. This being

the condition for native workers to specialise within the group is therefore given and is one key measurement putting Switzerland inline with experiences from other European countries and the US.

Several studies focusing on the effect of immigration on native wages in Switzerland led to no or at most minimal effects as for example Favre (2011), Gerfin & Kaiser (2010), Küng (2005) and Sheldon (2001) showed. Therefore the specialisation of native workers could be one reason, why the immense immigration inflow in Switzerland had no large impact on wages.

Regarding occupations Oesch & Rodriguez Menes (2010) reveal massive occupational upgrading in European countries and extensively so in Switzerland. This is an increasing demand for workers at the top of the occupational hierarchy, among managers and professionals in business and social services. This effect could also be caused by native workers specialising in these occupations.

To sum up, occupational upgrading and the imperfect substitution of native and foreign-born workers in Switzerland could have favoured native work force specialisation in Switzerland as a relevant tendency, explaining the low effects of immigration on native wages. In the next section I will thoroughly inspect the recent development of migration patterns within Switzerland to further examine the possibility of native specialisation due to immigration.

3 Migration Patterns in Switzerland

In this section I will describe the migration patterns in Switzerland, to be able to draw conclusions, how Switzerland could be affected in terms of native work force specialisation due to immigration. Important key figures when examining the effect on specialisation are the share of immi-

grants and their education as well as their distribution across occupations, which I will be focusing on in the next sub sections.

Immigration played an important role in the economic post-war development of Switzerland as the share of foreigners in Switzerland's total population rose from 5% in 1950 to more than 20% in recent years (Stalder 2010).

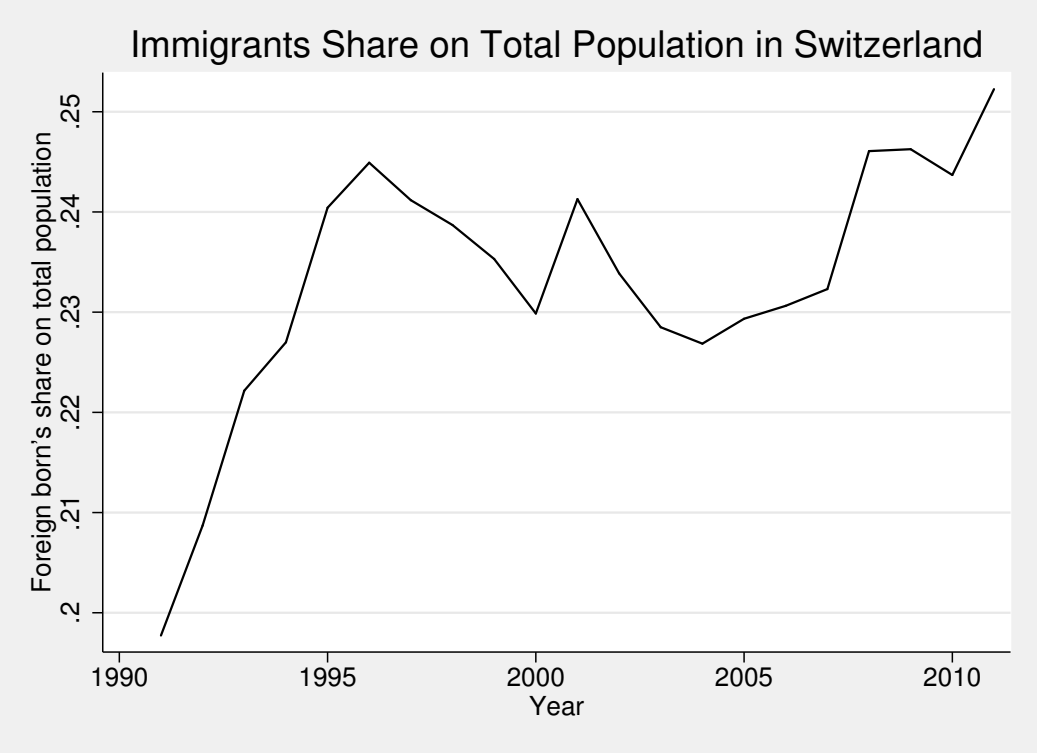

Figure 2: Immigrants Share on Total Population in Switzerland 1991-2011
Source: Author's calculations on SAKE data from 1991-2011.
Notes: This graph shows the share of foreign-born workers within the population of low and medium educated workers in Switzerland evolving over time.

The migration patterns in Switzerland drastically changed in the last two decades, as the main source countries of immigration shifted from third countries towards EU27 countries due to the Free Movement of Persons Agreement with the European Union.

The immigration flow was and still is always closely connected to the cyclical economic development of Switzerland through the labor demand of companies (SECO 2012). Figure 2 shows the close dependency of immigration share with the economic development in Switzerland as after the crisis in 2001 and 2009 the share of immigrants within Switzerland declined.

From 1991 to 2001 Switzerland had a mean net migration of +26'400 per year, whereas immigrants from third countries accounted for 26'000 and only 400 from EU27/EFTA countries.
This pattern radically changed with the enacting of the Free Movement of Persons Agreement with the European Union in june 2002 after which the net migration drastically increased. While the yearly mean net migration from EU27/EFTA countries rose to +36'700 from 2002 to 2011, the mean net migration from third countries, stayed nearly unchanged at +25'600 per year (SECO 2012).

This increase in net migration and the change of origin countries led to a change in immigrant attainments in terms of education, experience and skills, which I will further examine in the next sub sections.

3.1 Immigration and Education

Regarding education, immigrants are overrepresented at the bottom and the top of the education distribution since 2002 as stated by Favre (2011), Stalder (2010) and others.
Also mentioned by SECO (2012), the medium share of immigrants with a tertiary education increased from 38% in 1994-2002 to 51% in 2002 - 2010.

As shown in Figure 3, the share of immigrants in Switzerland with a high education is rising since 2002 whereas the share of immigrants with low education declined the last years. Still the share of immigrants with medium education is on a high level.

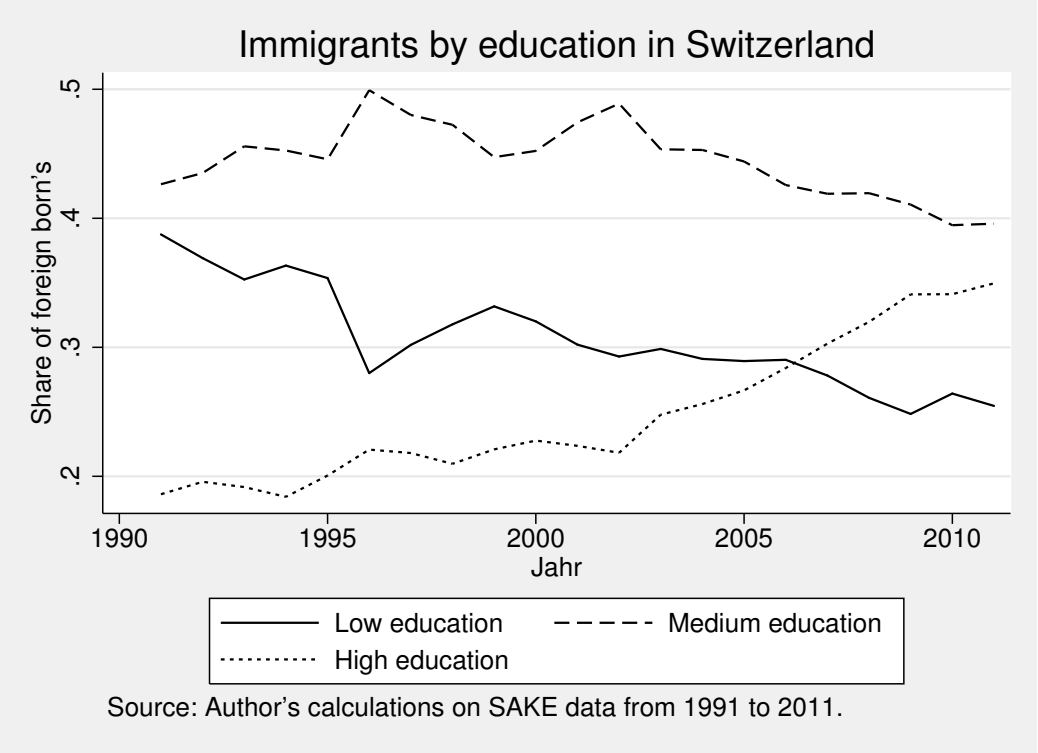

Figure 3: Foreign-born share of workers by education groups
Source: Author's calculations on SAKE data from 1991-2011.
Notes: Each line shows the share of foreign-born workers having the specified education on the total number of foreign-born workers within Switzerland. I.e. the solid line in 1991 shows that around 38% of all foreign-born workers in Switzerland have a low education.

After the Free Movement of Persons Agreement in 2002, occupations performed by highly educated workers experienced the highest percentage change in foreign-born's share, whereas before the agreement occupations with low and middle educated workers had the highest immigrant inflow (Table A.1).
Also after the agreement both occupations with high and low educated workers are affected by immigration where before mainly occupations with low and middle educated workers were affected.

In recent literature about task specialisation this observation of high

skilled foreign-born workers inflow is relatively new. It is supposed to behave like Peri & Sparber (2010) stated for the United States, where highly educated immigrants forced native workers to choose new occupations with less analytical and more communicative content. Therefore looking at task specialisation in terms of manual and communication skills should be an adequate instrument for Switzerland.

While many countries still experience mainly low educated immigrant inflows, Switzerland with its increased share of highly educated immigrants suggests a even stronger competition for native workers of all occupation groups because of the comparable educational attainment. I will therefore use the communication task intensity of native workers as a key measurement for native workers specialisation, as its communication and language skills are supposed to be one of the main differences between natives and foreign-borns.

3.2 Immigration and Skills

The foreign-born's share in occupations requiring high skills and education has steadily risen during the last decades (Figure 4).
During the years from 1991 to 2002, the share of foreign-born workers rose in all occupation groups except the professionals and elementary occupation groups. Whereas after 2002 all high and low ranked occupations experienced a higher foreign-born's share while the share felt in occupations ranked in the middle like clerks and service workers.

Figure 4 also reflects the significant increase in high educated immigrants, taking occupations in the upper ISCO mayor groups reflecting the higher skill intensity and therefore the immigrants compete with high skilled native workers which is also shown in Table A.1.

This observation is expected, due to the increased share of highly educated immigrants and otherwise inline with observations in other coun-

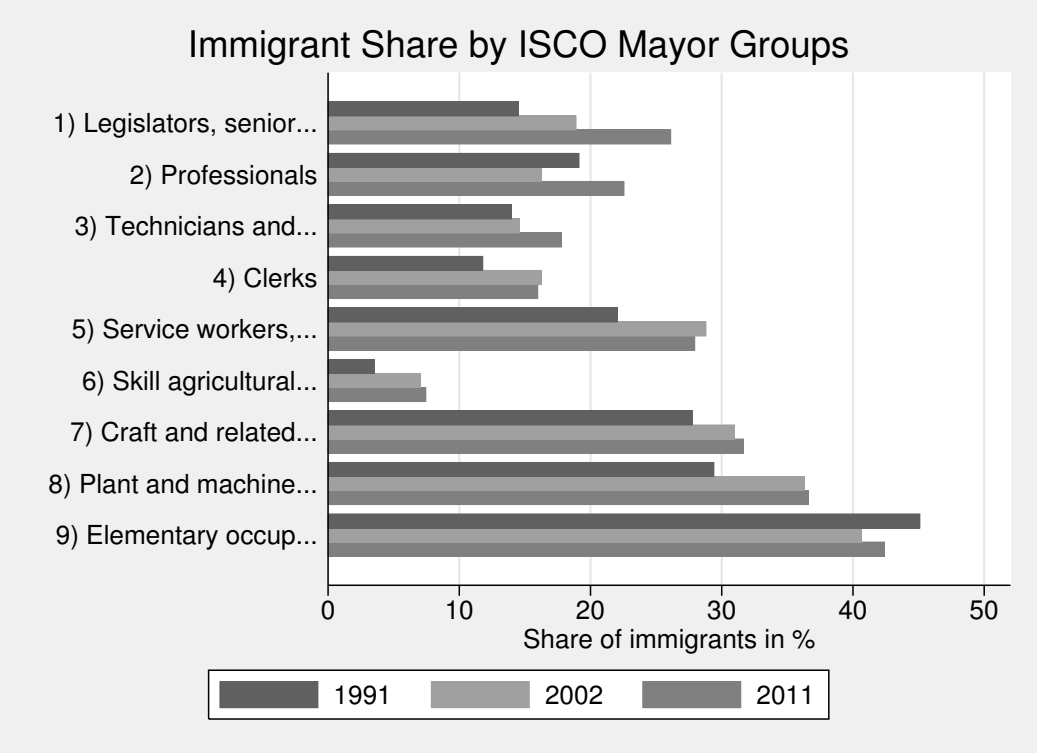

Figure 4: Foreign-born share of workers by ISCO mayor groups
Source: Author's calculations on SAKE data from 1991, 2002 and 2011.
Notes: This graph shows the evolvement of the share of foreign-born workers on total population within the ISCO Mayor Groups over time. I.e. in 1991 around 14% of all workers within the ISCO mayor group "1) Legislators,..." are foreign born. In section 5 the ISCO occupation groups are described in detail.

tries experiencing native work force specialisation due to immigration.

Figure 4 clearly shows the increased foreign-born share throughout all occupation groups. For further analysis these broadly defined mayor groups are too rough. Looking at sub-mayor groups in Table A.1, it is already a little bit refined and the relation between foreign-born's share and the communication-manual task intensity ratio can be seen. Therefore native workers gather among occupations with a high communication-manual intensity ratio, signed by the decreasing share of foreign-born workers.

We can therefore expect, Switzerland to behave similarly to other observations and thus the immigration leading to native work force specialisation in terms of moving to more communication intense tasks.

4 The Model

4.1 Production Function

I will follow the work from Peri & Sparber (2009) which provides a simple general equilibrium model of comparative advantages in task performance. I will shortly describe the model on the next pages and then test the key implications of the model in the following sections.

Beginning with a constant elasticity of substitution (CES) production function which combines two non-tradable intermediate services, Y_H and Y_L to produce a final tradable good Y in a perfect competitive market with cost minimisation and zero profits.

$$Y = [\beta Y_L^{\frac{\sigma-1}{\sigma}} + (1-\beta) Y_H^{\frac{\sigma-1}{\sigma}}]^{\frac{\sigma}{\sigma-1}} \tag{1}$$

Whereas $\sigma \in (0, \infty)$ measures the elasticity of substitution between Y_H and Y_L and β, $(1-\beta)$ captures their relative productivity.
Y_H / Y_L is provided by high/low educated workers (H and L) which are defined by workers with secondary education (Matura / Lehre) or less and workers with a tertiary education (university) or more.

The model further assumes that in the production of Y_L less-educated workers perform two types of tasks: manual (M) and communication (C). Manual tasks require the use of physical skills and communication tasks require language skills. Both tasks are combined in a CES function to Y_L with $\theta_L \in (0, \infty)$ measuring their elasticity of substitution and $\beta_L \in (0, 1)$ the relative productivity of manual skills.

$$Y_L = [\beta_L M^{\frac{\theta_L - 1}{\theta_L}} + (1 - \beta_L) C^{\frac{\theta_L - 1}{\theta_L}}]^{\frac{\theta_L}{\theta_L - 1}} \tag{2}$$

Highly educated workers are assumed to only perform analytical tasks that is communication and analytical skills, which are assumed highly substitutable, or are based on the idea that highly educated workers are not affected much by the presence of less educated immigrants, what Peri & Sparber (2009) showed empirically. Therefore the Production function of highly educated workers is given by $Y_H = H$.

Supposing a competitive labor market and perfect competition, the relative task demand can be expressed by equation (3).

$$\frac{C}{M} = (\frac{1 - \beta_L}{\beta_L})^{\theta_L} (\frac{w_C}{w_M})^{-\theta_L} \tag{3}$$

4.2 Relative Supply of Tasks

The wage paid to highly educated workers equals the marginal productivity of Y_H in (1): $w_H = P_H$.
Allowing heterogeneity between less educated workers in terms of relative task productivity let us account for native / domestic (L_D) and foreign-born (L_F) less educated workers.

Each less educated worker provides communication (ζ_i with $i = \{L_F, L_D\}$) and manual (μ_i) tasks.
Further $(\zeta_D / \mu_D) > (\zeta_F / \mu_F)$ is assumed to indicate the comparative advantage in communication tasks for native low educated workers.

If a worker has to choose to spend his endowment (time) on to the two different types of tasks, let l_i be the time spent on performing manual tasks and $(1 - l_i)$ the time spent on communication tasks. We then have $m_i = (l_i)^\delta \mu_i$ and $c_i = (1 - l_i)^\delta \zeta_i$ as the supply of manual and communication task units, with $\delta \in (0, 1)$ accounting for decreasing returns form

performing a single task to ensure no one will fully specialise.

Finally each less educated worker maximises his labor income w_D and w_F respectively, by dividing his endowment into communication and manual tasks, as given by equations (4) and (5). To account for the difference of foreign-born and native workers, foreign-borns get a fraction of their marginal productivity $(1-d) \in [0.1]$.

$$w_D = (l_D)^{\delta} \mu_D w_M + (1 - l_D)^{\delta} \zeta_D w_C \tag{4}$$

$$w_F = (1-d)(l_F)^{\delta} \mu_F w_M + (1 - l_F)^{\delta} \zeta_F w_C \tag{5}$$

By maximising the wages in respect to l_i, the equilibrium relative task supply for each type of worker (D or F) is given by equation (6) and the relative time spent on the two type of tasks by equation (7).

$$\frac{c_i}{m_i} = (\frac{w_C}{w_M})^{\frac{\delta}{1-\delta}} (\frac{\zeta_i}{\mu_i})^{\frac{\delta}{1-\delta}} \tag{6}$$

$$\frac{l_i}{1-l_i} = (\frac{\zeta_i w_C}{\mu_i w_M})^{\frac{1}{\delta-1}} \tag{7}$$

This model provides a one-to-one identifying relationship between relative efficiency in manual/communication tasks (ζ_i,μ_i) and occupational choice of workers of type i.

As in these simplified model there is no differentiation of abilities within the two types of workers i , μ_D/ζ_D is the endowment of all native workers and μ_F/ζ_F the endowment of foreign-born workers.
Each group will change their occupation if the relative compensation of tasks changes.
The product of individual task supply and total labor supply will be the aggregate task supply ($M_i = L_i m_i$ and $C_i = L_i c_i$).

Summing the task supply provided by each group will lead to the aggregate relative supply of tasks in the economy described by (8) with $\phi(f) = (M_F/(M_F + M_D)) \in (0,1)$ as the share of manual tasks supplied by foreign-born workers given by a simple monotonically increasing transformation of the foreign-born share of less educated workers.

$$\frac{C}{M_D} = \frac{C_F + C_D}{M_F + M_D} = \phi(f)\frac{C_F}{M_F} + (1 - \phi(f))\frac{C_D}{M_D} \tag{8}$$

With (6), (8) and equating relative supply and demand the equilibrium relative compensation of tasks is given by (9) with the function $\frac{\zeta}{\mu}(f, \frac{\zeta_F}{\mu_F})$ as the weighted average of relative skill endowments among the two worker groups (natives and immigrants), representing an aggregate measure of communication relative to manual ability in the economy. $\frac{\zeta}{\mu}(f, \frac{\zeta_F}{\mu_F})$ depends negatively on f and positively on $\frac{\zeta_F}{\mu_F}$.

$$\frac{w_C^*}{w_M^*} = (\frac{1-\beta_L}{\beta_L})^{\frac{(1-\delta)\theta_L}{(1-\delta)\theta_L+\delta}} [\frac{\zeta}{\mu}(f, \frac{\zeta_F}{\mu_F})]^{\frac{-1}{(1-\delta)\theta_L+\delta}} \tag{9}$$

By substituting (9) into the aggregate relative supply for domestic workers we find the relative provision of tasks equilibrium in (10) and the aggregated equilibrium in (11).

$$\frac{C_D^*}{M_D^*} = (\frac{1-\beta_L}{\beta_L})^{\frac{\delta\theta_L}{(1-\delta)\theta_L+\delta}} (\frac{\zeta_D}{\mu_D})^{\frac{1}{(1-\delta)}} [\frac{\zeta}{\mu}(f, \frac{\zeta_F}{\mu_F})]^{\frac{-1}{(1-\delta)\theta_L+\delta}\frac{\delta}{1-\delta}} \tag{10}$$

$$\frac{C^*}{M^*} = (\frac{1-\beta_L}{\beta_L})^{\frac{\delta\theta_L}{(1-\delta)\theta_L+\delta}} [\frac{\zeta}{\mu}(f, \frac{\zeta_F}{\mu_F})]^{\frac{\theta_L}{(1-\delta)\theta_L+\delta}} \tag{11}$$

4.3 Model Predictions

After explaining the model, I will now show how it predicts the impact of immigration on the specialisation of the native work force by their relative

supply of communication versus manual tasks.

An increasing share of foreign-borns in the population affects the model first through relative scarcity of native workers and their communication skills which increases the relative return of communication versus manual tasks, which is shown in equation (9). This affects equation (10) through an increased incentive, because of the higher wage return for native workers, to provide more communication tasks, which leads to an increase of the relative supply of communication tasks by natives.

Now the equation needs to be standardised, to be able to test it against real world datasets. This is done by log-linearising the key equilibrium conditions in (10). We then obtain equation (12) which maps the relative communication intensity provided by native less-educated workers to the foreign-born share in the population.

$$ln(\frac{C_D}{M_D})_{rt} = \gamma f_{rt} + \alpha_r^D + \tau_t^D + \epsilon_{rt}^D \tag{12}$$

Where ϵ_{rt}^D is the non-correlated zero-mean disturbance term, τ_t^D the time fixed effects accounting for time-varying technological parameters and α_r^D region fixed effects accounting for variation due to unobserved population characteristics. γ represents the key model implications from equation (12), $\gamma = -(1/((1-\delta)\theta_L + \delta))(\delta/(1-\delta)) \times (\partial ln(\zeta/\mu)/\partial f)$.

The model predicts γ to be positive, because in equation (10) the foreign-born's share of less-educated workers (f_{rt}) within a region causes native workers to increase their relative supply of communication tasks.

Therefore accounting for region and year fixed effects a 1 percentage point increase in the share of foreign-born workers within the region-year less educated workers is supposed to lead to a γ percent increase in relative communication to manual task supply by natives within the same

group.

5 Data and Descriptive Statistics

The main dataset being used in this thesis is the Swiss Labour Force Survey (SAKE) from 1991 to 2011[1]. It is a yearly household survey conducted for the first time in 1991 and provides information on the structure of the labour force and employment behaviour patterns. It is a telephone survey with around 126'000 interviews per year and therefore because of the small sample size not very accurate on a detailed level but because of the rich information perfectly suitable for aggregated analysis.

For the regression analysis I need data on foreign-born's share, canton of living, year of data collection, age, education and individuals occupation.

The analysis is restricted to the two periods 1991-2001 and 2002-2011 and only contains individuals in working age from 18 to 64 years old with a positive amount of hours worked and low or medium education.
Because of the large increase of highly educated foreign-born workers, I will focus on the low and medium educated population only, as this phenomenon of highly educated immigrant inflow could be handled in a separate study.

Individual occupations in Switzerland are coded using the ISCO-88 framework provided by the European Union. ISCO-88 organises the occupations in a hierarchical framework, with a job at the lowest level as the unit of classification. Jobs are grouped to occupations according to the degree of similarity in their constituent tasks and duties. ISCO-88 provides four levels of aggregation. An extensive description and a list of the dif-

[1] http://www.bfs.admin.ch/bfs/portal/en/index/infothek/erhebungen__quellen/blank/blank/enquete_suisse_sur/uebersicht.html

ferent levels of occupation grouping is available on their website[2].
For our purpose the matching of communication and manual task intensities is done on the lowest ISCO-88 aggregation level on the 4 digit unit groups.

The SAKE education variable provides 3 education groups: high school or less, secondary school and tertiary education like university and college. For the analysis I will follow Peri & Sparber (2009) and focus only on low and middle education groups.

Individuals in the SAKE dataset which are identified as foreign-born are classified as immigrants.

Finally skill measurements are supplied by the US Department of Labor's O*NET abilities survey. The O*NET is a widely used database which describes occupational features including ability measurements. Because of its mapping to US job titles, it is mainly used with US census data. Since there are some crosswalks mapping the US job titles to the standardised ISCO-88 occupation codes, there are some recent studies using the O*NET occupation features database because of its rich information also with European datasets (Cifuentes et al. 2010).
The O*NET database assigns for each occupation group numerical values to 52 distinct employee abilities. These abilities are used as tasks and skill measures and the provided numbers are recalculated to be comparable across occupations and mapped to the US SOC 1990 codes by Peri & Sparber (2009)[3].
After the recalculation a value of 0.02 in a specific skill means, that only 2 percent of all workers in the US in 2000 are supplying that specific skill less often.
For the analysis some of these skills are grouped together in manual skills containing strength, dexterity, body coordination and flexibility and com-

[2]http://www2.warwick.ac.uk/fac/soc/ier/research/links/isco88/
[3]data available on https://www.aeaweb.org/articles.php?doi=10.1257/app.1.3.135

munication skills containing oral and written expression and comprehension.

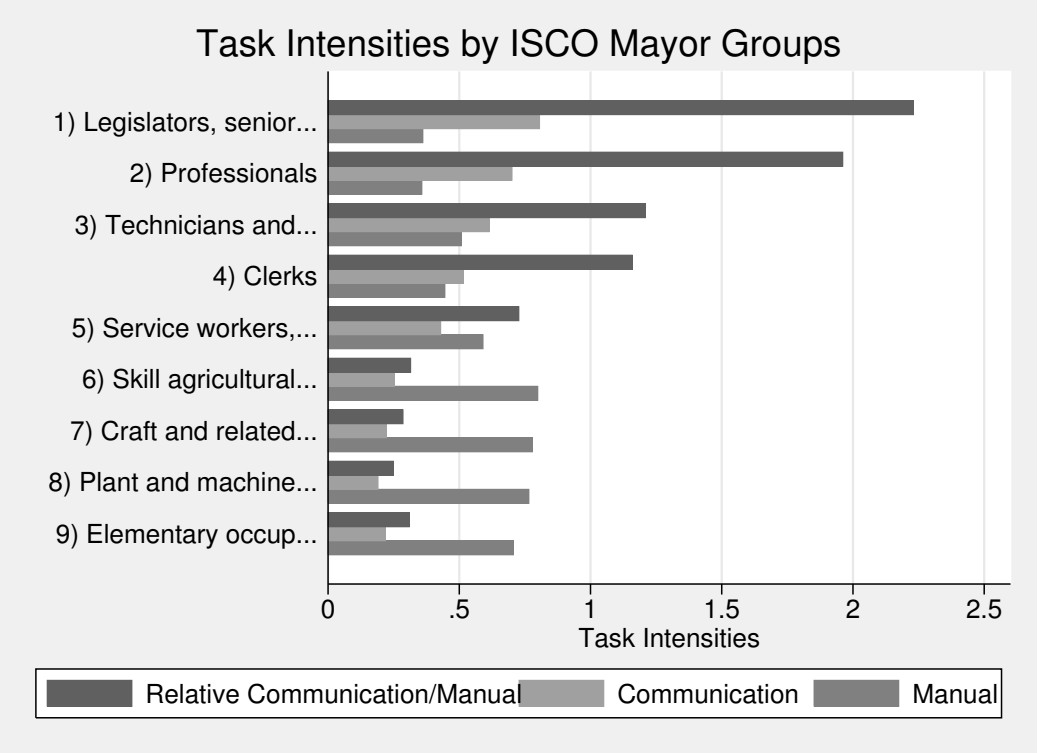

Figure 5: Task intensities by ISCO mayor groups

Source: Author's calculations on Peri & Sparber (2009) abilities dataset being recalculations of the O*NET abilities survey.

Notes: This graph shows the relative and absolute task intensities of communication and manual skills within the ISCO mayor groups.

In the analysis I will build upon these pre calculated variables as measures of communication and manual task intensity of occupations. As this data is mapped to US SOC codes, I will use the crosswalk by Paul Lambert (2003)[4] to map US SOC codes to ISCO 88 codes which are provided by the SAKE dataset. The abilities dataset uses the detailed US SOC codes which is then mapped to 4 digit ISCO-88 codes. A full list of occupations mappings can be found in the Appendix Table A.2.

[4]http://www.camsis.stir.ac.uk/occunits/us90toisco88v2.sps

Focusing on ISCO mayor occupation groups the communication-manual task intensities ratio rises with the occupation complexity and skill level. The ratio is highest within legislators, senior officials and managers and lowest within elementary occupations and plant and machine operators and assemblers (Figure 5).

Table 1: Descriptive Variable Statistics for the Years 2002-2011

1991-2001					
	Mean	Minimum	Maximum	Variance	Median
f	.2274628	0	.5932468	.0133737	.2215283
M^D	.6810061	.3999245	.970502	.010743	.6647032
C^D	.3053401	-.1304807	.6230747	.0257592	.3361611
$ln(C^D/M^D)$	-.8414724	-6.245571	.3298548	.7199826	-.6340535
$ln(C^D)$	-1.250581	-6.512939	-.4730889	.5660382	-1.06055
$ln(M^D)$	-.3958475	-.9164795	-.0299418	.023678	-.4084149
2002-2011					
	Mean	Minimum	Maximum	Variance	Median
f	.2319105	.0776128	.4426769	.0062502	.2235558
M^D	.5529981	.2376665	.9536186	.0244478	.5422863
C^D	.4574097	-.0278329	.8374213	.0585564	.4793341
$ln(C^D/M^D)$	-.3657868	-4.775834	1.259459	1.218147	-.0822374
$ln(C^D)$	-1.009488	-4.870568	-.177428	.7984439	-.731351
$ln(M^D)$	-.6326038	-1.436887	-.0474915	.0832796	-.6119617

Source: Author's calculations on SAKE 1991-2011 data.
Notes: Descriptive statistics of all variables used in the regression afterwards. All data variables are collapsed by canton on a yearly basis. f is the foreign born's share within the group, C^D, M^D the communication, manual task intensity of native workers respectively and C^D/M^D the relative communication to manual task intensity of native workers within the group.

The individual data is aggregated by Swiss cantons on a yearly basis. Therefore we have eleven years from 1991-2001 and ten years from 2002-2011 with each 26 Swiss cantons.
Because of the relative small sample size and small geographical dimensions of the Swiss cantons I will additionally group the aggregated dataset

into three broadly defined regions which I will use as dummy variables to control for regional differences.
The region variable is constructed with cantons grouped by geographical location which are also broadly connected by their native language (german, italian and french). Therefore I work with three regions where the cantons Waadt, Wallis, Neuenburg, Genf and Jura build the north-western region, the canton Tessin the southern region and all others the north-eastern region. This grouping is also based on the idea that workers will most probably not swap across language barriers.

A descriptive statistic table of all data variables used in this thesis for the regression analysis is shown in Table 1.

6 Empirical Results

This section will empirically test the relationships of foreign-born workers share and the native communication and manual task intensities within the medium and low educated population of Switzerland.
I will use the empirical specification of equation (12) identified by the theoretical model as the main estimation equation.

The regression is done using least squares and weighting each observation by employment in the cell, to account for variations in labor market sizes across cantons. Standard errors are clustered by canton.

Additionally I am testing whether immigration has a strong relationship with the average native workers supply of communication tasks with equation (13) and manual tasks with equation (14).

$$ln(c_D)_{rt} = \alpha_r^C + \tau_t^C + \gamma_t^C * f_{rt} + \epsilon_{rt}^C \tag{13}$$

$$ln(m_D)_{rt} = \alpha_r^M + \tau_t^M + \gamma_t^M * f_{rt} + \epsilon_{rt}^M \tag{14}$$

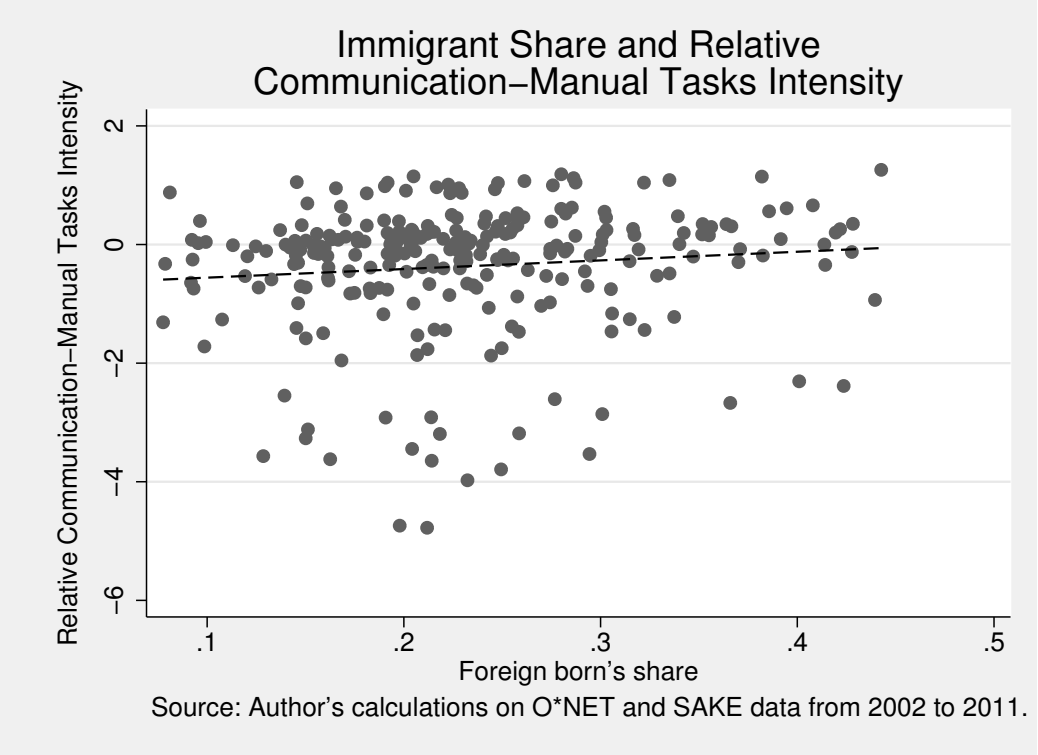

Figure 6: Foreign-born share of workers and logarithm of relative communication-manual tasks intensity
Source: Author's calculations on SAKE data from 2002-2011 and recalculated O*NET abilities data from Peri & Sparber (2009).
Notes: This Graph shows the relationship between the logarithm of relative communication-manual task intensity of native workers and the foreign-born's share within low and medium educated workers.

The regression will use region dummies to account for variations across these broadly specified regions as Peri & Sparber (2009) did with state dummies on US data, which was not applicable for Swiss data because of the small sample sizes within Swiss cantons and therefore this effect should be caught by the constructed three regions. Borjas (2003, 2006), Favre (2011) and others suggested that effects of immigration could dissipate across the whole country which could be especially true for small scale Switzerland, but Card (2001) and others argue for the use of region dummies and didn't experience any dissipation effects. Therefore I will run the regressions once with and once without region dummies.
Additionally including a yearly dummy variable will account for year spe-

cific effects.

Figure 6 shows the relationship between the logarithm of relative communication-manual task intensity of native workers and the foreign-born's share within low and middle educated workers which I am going to estimate.

The WLS regression estimates of γ, γ^C and γ^M are displayed in Table 2 where the columns (2) and (4) includes region and year dummies and (1) and (3) are limited to year dummies. Column (1) and (2) analysed the period from 1991-2001 while column (3) and (4) analyses the data from 2002-2011. All regressions cluster standard errors on the 26 Swiss cantons. Detailed regression results are listed in the Appendix in Table A.3 to A.6.

Table 2: Foreign-born workers and the native supply of tasks

	1991-2001		2002-2011	
	(1)	(2)	(3)	(4)
$ln(C_D/M_D)_{rt}$	1.230177***	1.76341***	1.568742***	2.176916**
	(0.23)	(0.36)	(0.23)	(0.62)
$ln(c_D)_{rt}$	1.013644***	1.486272***	1.27466***	1.777521**
	(0.22)	(0.35)	(0.22)	(0.58)
$ln(m_D)_{rt}$	-.2153643***	-.2777358***	-.3051352***	-.4072753***
	(0.05)	(0.06)	(0.03)	(0.06)
Region dummies	No	Yes	No	Yes

Source: Author's calculations on SAKE data from 1991-2011 and recalculated O*NET abilities data from Peri & Sparber (2009).
Notes: Dependent Variable: Foreign-born's share of workers with medium and low education in the region and year. Regressions are done on a dataset aggregated on a canton and year level. Each cell contains estimates from a separate regression with standard errors clustered by the 26 Swiss cantons. Standard errors are reported in parenthesis. To construct the average manual m_D and communication c_D skill supply by native workers in a region-year, I first run individual regressions to control for age, gender, experience, and race. The hours-weighted region average of this "cleaned" supply represents the values c_D and m_D and C_D/M_D is their ratio.
* $p \leq 0.10$ ** $p \leq 0.05$ *** $p \leq 0.01$

All regressions do provide significant results, suggesting that an increased immigration does affect the native work force by increasing their supply of communication tasks and decreasing the manual tasks supply as all estimates of γ are significant and positive.
Therefore immigration seems to force native workers to specialise in more communication task intensive occupations.
Regarding the Region dummies they mostly seem to be insignificant or only significant on a low level and could therefore be omitted or should be replaced by a more accurate measurement as for example commuting regions.

Column (1) suggests that a 1 percentage-point increase in the foreign-born share of less and medium educated workers is associated with an 1.23 percent increase in the relative supply of communication-manual tasks within native workers of the same group. This effect is pretty high compared to results of studies within the United States and should therefore be interpreted carefully and further analysed. The important results nevertheless are the significant positive estimations of γ and the significant increase of the estimators after the Free Movement of Persons Agreement in 2002.

Comparing the two time periods, before and after the Free Movement of Persons Agreement in 2002, the effect of immigration on communication and manual task intensities of native workers strongly increased and suggests a even stronger specialisation of native workers when affected by immigration since 2002.
Therefore the changed immigration patterns due to the Free Movement of Persons Agreement in 2002 led to an increase in communication specialisation, a decrease in manual task intensity and a increased relative supply, which could be explained by the increased competition through the increased net migration and also increased demand for managing the new immigrated workers which requires communication skills.
The exact source of the increased magnitude of immigration effects could

be part of future research efforts.

7 Conclusion

The Swiss labour market has been significantly affected by immigration during the last decades which led to increasing economic debate about the consequences of immigration. Many of the studies examined the effects of immigration on native wages but did not find large effects. Given the huge immigration inflow and the low wage effects, the model of specialisation of the native work force could provide an explanation for the low wage effects.

In this thesis I examine the extent of task specialisation of the native work force due to immigration in Switzerland. Using the simple task based model from Peri & Sparber (2009) as an explanatory framework, this thesis provides new empirical evidence for Switzerland.

Using the SAKE data from 1991 to 2011 merged with the O*NET abilities survey to measure the task content of occupations, I find significant results suggesting that, within low and middle educated workers, immigration indeed forces native workers to specialise in occupations with more intense communication task contents.

With the enacting of the Free Movement of Persons Agreement with the European Union in 2002 the magnitude of these effects drastically increased, pushing native workers to even more communication intensive tasks.

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A Appendix

Table A.1: ISCO sub-mayor groups ranked by change in foreign-born's share

1993-2002					
ISCO	ISCO Sub-Mayor Group Title	C^D/M^D	C^D/M^D Rank	% of workers in Low & Middle Education	$\Delta f/f_{1993}$
92	Agricultural, fishery and related labourers	0.086	21	86.36%	83.98%
73	Precision, handicraft, craft printing and related...	0.576	13	92.24%	69.732%
51	Personal and protective services workers	0.602	12	89.93%	35.38%
⋮		⋮	⋮	⋮	⋮
81	Stationary plant and related operators	0.241	16	91.89%	-25.86%
31	Physical and engineering science associate...	0.984	10	71.65%	-36.87%
23	Teaching professionals	2.193	3	24.29%	-39.84%
2002-2011					
ISCO	ISCO Sub-Mayor Group Title	C^D/M^D	C^D/M^D Rank	% of workers in Low & Middle Education	$\Delta f/f_{2002}$
22	Life science and health professionals	1.603	8	4.22%	209.63%
23	Teaching professionals	2.182	3	12.13%	138.35%
31	Physical and engineering science associate...	0.955	10	66.63%	59.18%
⋮		⋮	⋮	⋮	⋮
11	Legislators and senior officials	3.322	1	35.09%	-11.39%
41	Office clerks	1.788	6	82.43%	-13.55%
73	Precision, handicraft, craft printing and related...	0.640	12	85.29%	-15.93%

The 3 highest and 3 lowest ISCO sub-mayor groups sorted by the percentage change in foreign-borns share in 1993 to 2002 and 2002 to 2011 respectively. C^D/M^D is the relative communication-manual task intensity provided by native born workers.

Relative Communication-Manual task intensity calculations are based on O*NET abilities survey and the foreign born's share and education calculations are based on the SAKE dataset from 1993, 2002 and 2011

Table A.2: Mapping of US SOC 90 occupation codes to ISCO-88 codes

US SOC 90	ISCO-88	US SOC 90	ISCO-88	US SOC 90	ISCO-88	US SOC 90	ISCO-88	US SOC 90	ISCO-88	US SOC 90	ISCO-88	US SOC 90	ISCO-88
3	1110	4	1120	5	1120	6	1120	7	1231	8	1232	9	1233
13	1233	14	1229	15	1229	16	1226	17	1315	18	5121	19	5143
21	1310	22	1310	23	2411	24	3412	25	3410	26	2149	27	2412
28	3416	29	3416	33	3416	34	2419	35	3151	36	3444	37	1229
43	2141	44	2145	45	2147	46	2147	47	2146	48	2146	49	2145
53	2142	54	2213	55	2143	56	2149	57	2145	58	2145	59	2149
63	2148	64	2131	65	2121	66	2121	67	2122	68	2121	69	2111
73	2113	74	2112	75	2114	76	2110	77	2213	78	2211	79	2213
83	2221	84	2221	85	2222	86	2223	87	3224	88	3226	89	3229
95	2230	96	2224	97	3223	98	3226	99	3226	103	3226	104	3229
105	3226	106	3221	113	2310	114	2310	115	2310	116	2310	117	2310
118	2310	119	2310	123	2310	124	2310	125	2310	126	2310	127	2310
128	2310	129	2310	133	2310	134	2310	135	2310	136	2310	137	2310
138	2310	139	2310	143	2310	144	2310	145	2310	146	2310	147	2321
148	2321	149	2322	153	2310	154	2310	155	2332	156	2331	157	2321
158	2340	159	2359	163	2412	164	2432	165	2431	166	2441	167	2445
168	2442	169	2442	173	2141	174	2446	175	3460	176	2460	177	3480
178	2421	179	2422	183	2451	184	2451	185	3471	186	3473	187	2455
188	2452	189	3131	193	3473	194	3470	195	2451	197	2419	198	3472
199	3475	203	3211	204	3225	205	2432	206	3133	207	3231	208	3211
213	3113	214	3119	215	3115	216	3119	217	3118	218	3118	223	3211
224	3111	225	3111	226	3143	227	3144	228	3132	229	2132	233	3123
234	2421	235	3100	243	1314	253	3412	254	3413	255	3411	256	3429
257	3429	258	3415	259	3415	263	5220	264	5220	265	5220	266	5220
267	5220	268	5220	269	5220	274	5220	275	5220	276	4211	277	9110
278	9112	283	5210	284	3417	285	5200	303	1240	304	1240	305	1231
306	4223	307	4133	308	3122	309	3122	313	4115	314	4111	315	4111
316	4190	317	4222	318	4221	319	4222	323	4222	325	4190	326	4100
327	4132	328	4121	329	4141	335	4141	336	4190	337	4121	338	4121
339	4121	343	4121	344	4114	345	4190	346	4142	347	4114	348	4223
353	3132	354	4142	355	4142	356	4212	357	9151	359	4133	363	4132
364	4131	365	4131	366	9153	368	4131	373	4133	374	4132	375	3417
376	3417	377	3443	378	4215	379	4100	383	4212	384	4143	385	4113
386	4122	387	3310	389	4190	403	8264	404	5122	405	5121	406	5131
407	9132	413	5161	414	5162	415	9152	416	5161	417	5161	418	5162
423	5162	424	5163	425	8312	426	5169	427	5169	433	5121	434	5123
435	5123	436	5122	438	5123	439	9132	443	5123	444	5120	445	3225
446	3221	447	5132	448	9141	449	9131	453	9140	454	9151	455	7143
456	5141	457	5141	458	5141	459	9152	461	5113	462	9152	463	9152
464	9151	465	3460	466	5131	467	3320	468	5131	469	5100	473	6133
474	6113	475	1311	476	1311	477	6132	479	9211	483	6151	484	9211
485	6132	486	9211	487	9211	488	7415	489	3152	494	6141	495	9142
496	6141	497	3142	498	6150	499	6154	503	7230	505	7231	506	7231
507	7231	508	7232	509	7230	514	7213	515	7232	516	7233	517	7233
518	7233	519	7233	523	7242	525	7242	526	7241	527	7245	529	7244
533	7241	534	7241	535	7310	536	7222	538	7242	539	7233	543	7233
544	7233	547	7230	549	7230	553	7122	554	7124	555	7240	556	7141
557	7136	558	7510	563	7122	564	7122	565	7132	566	7132	567	7132
569	7124	573	7129	575	7137	576	7137	577	7245	579	7141	583	7141
584	7133	585	7136	587	7136	588	7123	589	7135	593	7134	594	8332
595	7131	596	7213	597	7214	598	8113	599	7129	613	7110	614	8113
615	7112	616	8111	617	7111	628	7510	634	7222	635	7222	636	7311
637	7222	639	7223	643	7213	644	7224	645	7222	646	7222	647	7313
649	7343	653	7213	654	7213	655	7213	656	7422	657	7422	658	7422
659	7420	666	7433	667	7433	668	7437	669	7442	674	7436	675	7310
676	7310	677	7322	678	7311	679	7345	683	8282	684	7310	686	7411
687	7412	688	8270	689	9321	693	7331	694	8163	695	8161	696	8160
699	8160	703	7223	704	8211	705	8211	706	8211	707	8122	708	8211
709	8223	713	7221	714	7223	715	8211	717	8400	719	8122	723	8223
724	8123	725	8290	726	8141	727	8141	728	8240	729	8240	733	8141
734	8251	735	7344	736	7341	737	8251	738	8261	739	8262	743	8269
744	8263	745	8266	747	8264	748	8264	749	8269	753	8229	754	8290
755	8229	756	8151	757	8154	758	8290	759	7142	763	8274	764	8275
765	8290	766	8131	768	8151	769	8290	773	3132	774	8251	777	8290
779	8290	783	7212	784	7212	785	8290	786	7520	787	7520	789	7141
793	7323	795	7520	796	8290	797	8290	798	8290	799	8290	803	4133
804	8324	806	8322	808	8323	809	8322	813	9152	814	9333	823	5112
824	8311	825	8312	826	8310	828	8340	829	8340	833	3141	834	8340
843	7520	844	8330	845	8333	848	8333	849	8333	853	8332	855	8332
856	8334	859	8330	864	7510	865	7234	866	9313	867	9313	868	9311
869	9313	874	9320	875	9161	876	9333	877	9333	878	9321	883	9333
885	7234	887	9142	888	9322	889	9300	903	110	904	110	905	110

Source: Paul Lambert (2003) (http://www.camsis.stir.ac.uk/occunits/us90toisco88v2.sps)
Notes: Mapping of US SOC 90 occupation codes to ISCO-88 four digit codes.

Table A.3: Foreign-born Workers and the Native Supply of Tasks without region dummies 1991-2001

	$ln(c_D/m_D)$	$ln(c_D)$	$ln(m_D)$
f	1.230177***	1.013644***	-.2153643***
	(0.23)	(0.22)	(0.05)
y2	-.7448036***	-.4742726***	.2705156***
	(0.03)	(0.02)	(0.01)
y3	-.5668497***	-.3433491***	.2234694***
	(0.03)	(0.02)	(0.01)
y4	-.7410498***	-.4716138***	.2693986***
	(0.02)	(0.02)	(0.01)
y5	-.8204196***	-.5519433***	.2684247***
	(0.03)	(0.03)	(0.01)
y6	-2.410448***	-1.861747***	.548895***
	(0.12)	(0.12)	(0.01)
y7	-.6118011***	-.3811955***	.2305545***
	(0.04)	(0.03)	(0.01)
y8	-.5287092***	-.3342823***	.1943723***
	(0.03)	(0.02)	(0.01)
y9	-4.881031***	-4.458661***	.4349388***
	(0.90)	(0.89)	(0.01)
y10	-.8700706***	-.5826167***	.2874122***
	(0.03)	(0.03)	(0.01)
y11	-.6188269***	-.1511142***	.4676564***
	(0.02)	(0.02)	(0.01)
_cons	-.2199054***	-.8621325***	-.6424731***
	(0.05)	(0.05)	(0.01)
R^2	.8795232	.8634068	.9396622
N	266	266	288

Source: Author's calculations on SAKE 1991-2001 and recalculated O*NET abilities data from Peri & Sparber (2009).
Note: Fixed effects regressions clustered by cantons. Standard errors are reported in parenthesis. f is the foreign-born's share of workers with medium and low education within the year canton cell and y* the yearly dummies for 1991-2001.
* $p \leq 0.10$ ** $p \leq 0.05$ *** $p \leq 0.01$

Table A.4: Foreign-born Workers and the Native Supply of Tasks with region dummies 1991-2001

	$ln(c_D/m_D)$	$ln(c_D)$	$ln(m_D)$
f	1.76341***	1.486272***	-.2777358***
	(0.36)	(0.35)	(0.06)
r2	-.1490664*	-.1300607*	.0172462
	(0.06)	(0.06)	(0.02)
r3	-.1878766***	-.1670845***	.0214546
	(0.04)	(0.04)	(0.02)
y2	-.7536568***	-.4821116***	.2715473***
	(0.03)	(0.02)	(0.01)
y3	-.578631***	-.3537928***	.2248535***
	(0.03)	(0.03)	(0.01)
y4	-.7560814***	-.4849425***	.2711615***
	(0.03)	(0.03)	(0.01)
y5	-.8420514***	-.5711073***	.2709605***
	(0.03)	(0.03)	(0.01)
y6	-2.436067***	-1.884452***	.5518863***
	(0.12)	(0.12)	(0.01)
y7	-.6323718***	-.399428***	.2329675***
	(0.04)	(0.04)	(0.01)
y8	-.5502623***	-.3533803***	.1969022***
	(0.04)	(0.03)	(0.01)
y9	-4.861874***	-4.441271***	.4371318***
	(0.88)	(0.87)	(0.01)
y10	-.8863363***	-.5970411***	.2893211***
	(0.04)	(0.03)	(0.01)
y11	-.6415377***	-.1712493***	.4703199***
	(0.03)	(0.03)	(0.01)
_cons	-.2881851***	-.922625***	-.6343739***
	(0.07)	(0.07)	(0.01)
R^2	.8848349	.8686237	.9418497
N	266	266	288

Source: Author's calculations on SAKE 1991-2001 and recalculated O*NET abilities data from Peri & Sparber (2009).
Note: Fixed effects regressions clustered by cantons. Standard errors are reported in parenthesis. f is the foreign-born's share of workers with medium and low education within the year canton cell, r* are the region dummies and y* the yearly dummies for 1991-2001.
* $p \leq 0.10$ ** $p \leq 0.05$ *** $p \leq 0.01$

Table A.5: Foreign-born Workers and the Native Supply of Tasks without region dummies 2002-2011

	$ln(c_D/m_D)$	$ln(c_D)$	$ln(m_D)$
f	1.568058***	1.123055***	-.4444496***
	(0.20)	(0.14)	(0.06)
y2	.718114***	.5752517***	-.1428594***
	(0.03)	(0.03)	(0.00)
y3	1.430272***	1.508669***	.0784019***
	(0.05)	(0.04)	(0.00)
y4	1.428882***	1.114975***	-.3139052***
	(0.04)	(0.04)	(0.01)
y5	1.522414***	1.263016***	-.2593962***
	(0.04)	(0.04)	(0.01)
y6	.9462709***	.851276***	-.0949944***
	(0.04)	(0.04)	(0.01)
y7	-1.884076***	-1.480692***	.407877***
	(0.14)	(0.14)	(0.01)
y8	1.154218***	1.075234***	-.0789913***
	(0.04)	(0.04)	(0.00)
y9	2.330952***	1.562207***	-.7687515***
	(0.04)	(0.05)	(0.01)
y10	1.771854***	1.491115***	-.2807501***
	(0.04)	(0.04)	(0.01)
_cons	-1.688526***	-2.088886***	-.4004975***
	(0.07)	(0.06)	(0.01)
R^2	.9652424	.952649	.9795228
N	255	255	260

Source: Author's calculations on SAKE 2002-2011 and recalculated O*NET abilities data from Peri & Sparber (2009).
Note: Fixed effects regressions clustered by cantons. Standard errors are reported in parenthesis. f is the foreign-born's share of workers with medium and low education within the year canton cell and y* the yearly dummies for 2002-2011.
* $p \leq 0.10$ ** $p \leq 0.05$ *** $p \leq 0.01$

Table A.6: Foreign-born Workers and the Native Supply of Tasks with region dummies 2002-2011

	$ln(c_D/m_D)$	$ln(c_D)$	$ln(m_D)$
f	2.11851***	1.425475***	-.6826757***
	(0.36)	(0.26)	(0.10)
r2	-.066633	-.0270345	.038112*
	(0.06)	(0.04)	(0.02)
r3	-.1577254*	-.0877796	.0676354**
	(0.07)	(0.05)	(0.02)
y2	.7211133***	.5768925***	-.1441644***
	(0.03)	(0.03)	(0.01)
y3	1.435137***	1.511349***	.0763026***
	(0.04)	(0.04)	(0.01)
y4	1.4314***	1.116371***	-.3149828***
	(0.04)	(0.04)	(0.01)
y5	1.52464***	1.264247***	-.2603527***
	(0.04)	(0.04)	(0.01)
y6	.9468043***	.8515807***	-.0952145***
	(0.04)	(0.04)	(0.01)
y7	-1.893225***	-1.485793***	.4108233***
	(0.13)	(0.14)	(0.01)
y8	1.146508***	1.070996***	-.0756587***
	(0.04)	(0.04)	(0.01)
y9	2.324457***	1.558641***	-.7659391***
	(0.04)	(0.05)	(0.01)
y10	1.760482***	1.484872***	-.2758228***
	(0.05)	(0.05)	(0.01)
_cons	-1.788861***	-2.144136***	-.3572937***
	(0.07)	(0.05)	(0.02)
R^2	.9673018	.9536579	.9848818
N	255	255	260

Source: Author's calculations on SAKE 2002-2011 and recalculated O*NET abilities data from Peri & Sparber (2009).
Note: Fixed effects regressions clustered by cantons. Standard errors are reported in parenthesis. f is the foreign-born's share of workers with medium and low education within the year canton cell, r* are the region dummies and y* the yearly dummies for 2002-2011.
* $p \leq 0.10$ ** $p \leq 0.05$ *** $p \leq 0.01$