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Will There Be a Shortage of Skilled Labor? An East German Perspective to 2015

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An East German Perspective to 2015**

*Herbert S. Buscher, Eva Dettmann,
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Will there be a Shortage of Skilled Labor? An East German Perspective to 2015

Abstract

We analyze the supply and demand of skilled labor in an East German federal state, Thuringia. This state has been facing high unemployment in the course of economic transformation and experiences population aging and shrinking more rapidly than most West European regions. In a first step, we use extrapolation techniques to forecast labor supply and demand for the period from 2009 to 2015, disaggregated by type of qualification. The analysis does not corroborate the notion of an imminent skilled-labor shortage but provides hints for a tightening labor market for skilled workers. In a second step, we ask firms about their appraisal of future recruitment conditions, and both current and planned strategies in the context of personnel management. The majority of firms plans to expand further education efforts and to hire older workers. The study closes with policy recommendations to prevent occupational mismatch.

Key words: demographic change, labor demand for high-skilled workers, labor force forecast, vocational training

JEL classification: J11, J21, J24

Wird es einen Fachkräfte-Engpass geben? Eine ostdeutsche Perspektive bis 2015

Zusammenfassung

Wie andere ostdeutsche Bundesländer auch steht Thüringen noch immer einer hohen Arbeitslosigkeit infolge des ökonomischen Transformationsprozesses gegenüber und erfährt eine schnellere Alterung und Schrumpfung der Bevölkerung als die meisten Regionen Westeuropas. Unter Verwendung von Extrapolationsmethoden wird im Beitrag für das Bundesland Thüringen eine Fortschreibung des Angebots an und der Nachfrage nach Fachkräften – disaggregiert nach Qualifikationsarten – bis 2015 vorgestellt. Dabei weist die Analyse nicht auf einen unmittelbar bevorstehenden Fachkräfteengpass hin, liefert aber dennoch Hinweise auf einen enger werdenden Arbeitsmarkt für Fachkräfte. Auf Grundlage einer im Sommer 2008 durchgeführten Befragung von rund 1 000 thüringischen Unternehmen wird untersucht, inwieweit Unternehmen diese Entwicklung bereits heute als Problem einschätzen und welche Vorkehrungen sie im Bereich Personalpolitik gegebenenfalls treffen werden. Die Mehrzahl der Unternehmen plant den Ausbau von Weiterbildungsaktivitäten sowie die Einstellung bzw. die Beschäftigung von älteren Arbeitnehmern. Die Studie schließt mit Handlungsempfehlungen zur Reduzierung des Mismatch zwischen Qualifikationsangebot und -nachfrage.

Schlüsselwörter: Demographischer Wandel, Arbeitsnachfrage, Fachkräfte, Prognose des Arbeitsangebots, Berufsausbildung

JEL-Klassifikation: J11, J21, J24

Will there be a Shortage of Skilled Labor? An East German Perspective to 2015¹

1 Introduction

Human capital is a crucial factor for economic growth in twenty-first-century Europe. As most European countries face the problem of an ageing and shrinking population – and even more so among the labor force – the future trajectory of human capital and the consequences for economic growth have gained considerable attention. While prophecies of skilled-labor shortages have been lessened by the current financial and economic crisis, one may fear nevertheless that such problems could become chronic because demographic changes do not follow the short-run pattern of business cycles. East Germany may provide an interesting example, inasmuch as the implosion of birth rates following German reunification implies that currently only very small cohorts are reaching working age. At the same time, the economic transformation process, which resulted in soaring unemployment rates, still has ramifications in the present day. We use evidence from the federal state of Thuringia, which reflects the East German experience quite well.

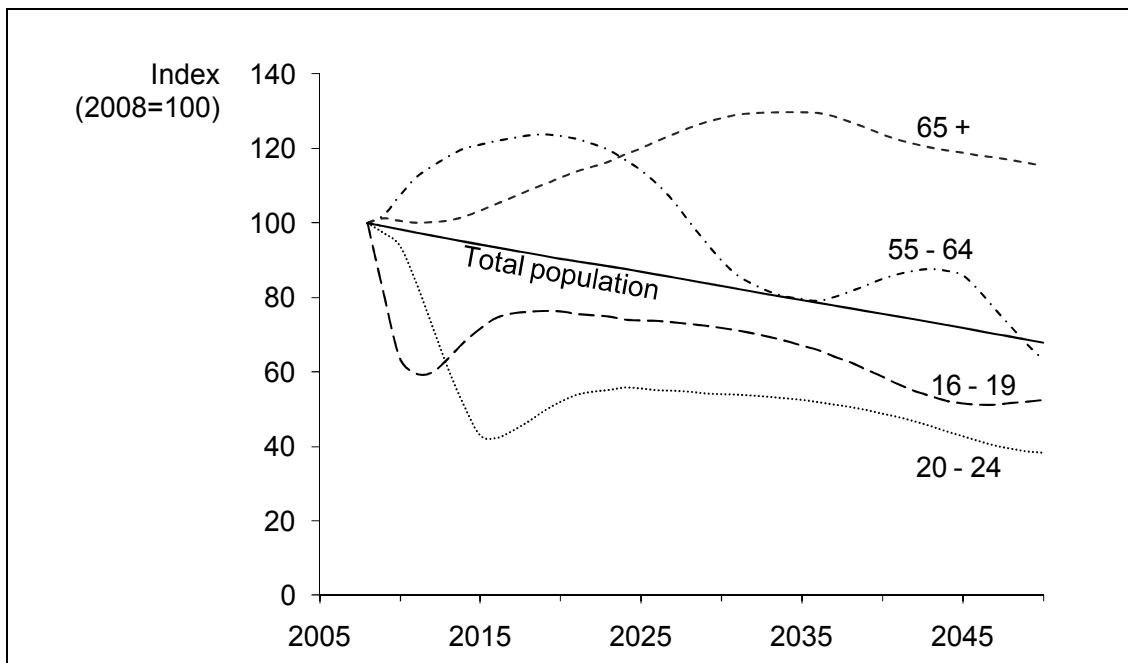
As Figure 1 shows, the number of young adults will drop by more than 40 percent. This process has already started in the group of young people who leave school and apply for apprenticeships. In the cohort aged 20-24 years (most of whom have already completed vocational training), the consequences of demographic change will show up in the next years, reaching a trough in 2015. The age composition of the employees is also changing: between 2002 and 2007, the share of employees aged 55 years or older had already increased by nearly two percentage points, whereas the share of employees aged 35 years to 49 years dropped by more than one percentage point. Generally speaking, it will become more difficult for firms to meet their demand for qualified and highly qualified personnel. This might be considered as an additional challenge for the economic development of Thuringia, which has not yet fully reached the West German average.

In 2007, GDP per hour worked in Thuringia amounted to 70 percent of the respective West German value, and the unemployment rate of 11.3 percent exceeded the Western level by almost 5 percentage points. Nine out of 10 Thuringian firms employ fewer than 20 workers. Approximately a quarter of the employees (in jobs covered by social security) work in the manufacturing sector, whereas the sectors trade, firm-related services,

1 The authors thank Christian Schmeißer for excellent support in preparing the survey of Thuringian firms. The Thuringian Ministry of Economics, Technology, and Labor provided financial support.

and health & social care services each comprise about 12 percent of total employment. With respect to the occupational structure, metalworking jobs play a major role in Thuringia, and their share among total dependent employment has been rising in the last years. Currently, 12 percent of Thuringian employees work in this field of occupation, a figure similar to office jobs. While 27 percent of all employees in Thuringia are older than 50 years, this share amounts to 23 percent in Germany as a whole. Female employment amounts to 48 percent of the employees in Thuringia, compared to 44 percent in West Germany.

Figure 1:
Population Forecast for Selected Age Groups in Thuringia



Source: Authors' calculations on the basis of the 11th coordinated population forecast by the German Statistical Office.

On average, workers in the state have a higher (formal) qualification level than their West German counterparts. Due to high unemployment in East Germany, recruiting workers who were overqualified for a certain position used to be common practice. As these workers could also be assigned to higher qualified tasks within the firm, experience of training investment may have been rare until now. A further concern in the context of skilled-labor supply is the high out-migration of young people, especially women, towards West German states, mostly to Bavaria and Hesse (Kubis and Schneider 2007). And in most cases, people leaving Thuringia have at least a medium-level qualification. Commuting to other states remains a frequent phenomenon as well: one in six employees living in Thuringia works outside the state.

Taking these characteristics into account, this article offers evidence on the appraisal of future recruitment problems by small and medium-sized firms, and on their current and planned strategies in the context of personnel management. The article is organized as follows. First we present our forecast results for labor demand and labor supply in Thuringia. A comparison of demand and supply then provides an impression of possible shortages of skilled labor. Next we offer the results of a survey of firms in Thuringia on problems and strategies in the context of personnel management. The study concludes with policy recommendations for the prevention of occupational mismatch.

2 Forecast of Labor Demand and Supply in Thuringia

In order to obtain an impression of possible shortages in the labor market, we forecast the demand and supply of labor in Thuringia for the period 2009-2015. We apply the Manpower Requirement Approach, which allows us to distinguish conditions for several types of qualification (e.g. Blaug 1967). It is commonly applied in the literature for labor market developments, for example in European countries (e.g., Beekman et al. 1991; Bonin et al. 2007) or the OECD (Schömann et al. 2000). After describing the method, and forecasting the development of supply and demand, we juxtapose the qualification-specific results.

Manpower Requirement Approach

This method is characterized by separately forecasting demand and supply. Interactions between both sides of the labor market are not considered, i.e., adjustment and substitution effects due to wages are neglected.

The future volume of labor demand is assumed to follow the development of economic sectors. It is further assumed that growth of a particular sector will lead to proportional rise in the demand for each qualification level. Substitutions between the qualification levels are not considered.²

Future Labor Supply

In order to determine the future labor supply, three important aspects have to be considered: demographic developments, the qualification of the population, and their labor market participation. For the forecast of demographic trends, we use the results of the 11th coordinated population projection of the Federal Statistical Office (Statistisches Bundesamt 2006), variant 1.³ According to this projection, the population in Thuringia will decrease by about 7 percent in the forecasting period. The potential labor supply, the population aged between 15 years and 65 years, is of particular importance for economic development. In this group, the population decline is even stronger. In Thuringia

² Another strand of forecasting literature uses macroeconomic models to estimate the development of the labor market (*Fuchs and Söhnlein 2005; Meyer et al. 2007; Reinberg and Hummel 2002*). In these models, assumptions are made about the interdependencies of and relations between single market segments and the behavior of the actors. Then the development of the labor market and the economic sectors is deduced from the results of these assumed interactions. However, it is argued in the literature that such models substitute the uncertainty of labor market development by the uncertainty of the development of exogenous factors and implied interactions (*Bonin et al. 2007*).

³ This variant assumes a nearly constant fertility (1.4 children per woman), a rising life expectancy (88 years for women and 83.5 years for men in 2050), and an annual net immigration of 100 000 persons to Germany.

– as in the other East German states – demographic change starts to affect the working-age population in the period considered.

The actual labor supply consists of the persons who want to work, depending on labor market conditions. In our forecast we use the ‘labor force’ concept, which covers both employed persons and unemployed job seekers, irrespective of their registration at the Federal Employment Agency. While our definition of labor force includes commuters who live in Thuringia and work in a different state, it excludes commuters from other states who work in Thuringia. To predict the share of the labor force among the total population, we consider age-specific labor force participation rates. As the labor force participation varies by qualification level, the qualification of the Thuringian population is considered as well. According to the vocational qualification, the following qualification structure is defined: low-skilled persons have no vocational education degree; skilled persons are individuals with vocational education and higher job-specific qualifications, such as technician or master craftsman; and high-skilled persons have finished an academic education.

Age-specific information on the current labor force participation rate and the qualification structure can be found in the German Micro Census (Mikrozensus) 2005.⁴ From these data, information on the highest vocational qualification for the residents of Thuringia is used to determine the qualification structure. However, there is a problem in determining the qualification of young people aged 15-29 years, for they may still attend education institutions and not yet have obtained their final degree. As a remedy, the qualification structure in the age group 30-40 years is assigned to individuals aged below 30 years. At ages above 30 years, about three-quarters of the population constitute the skilled group, c. 15 percent have an academic degree, whereas one in 10 is a member of the low-skilled group.

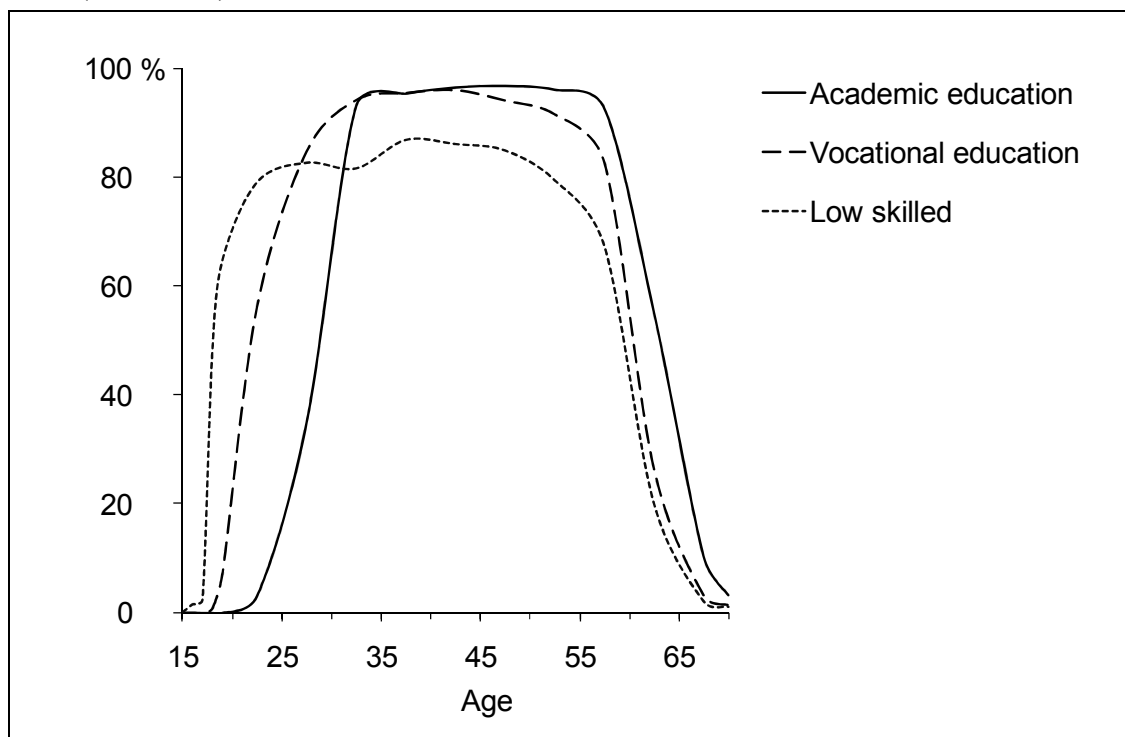
For each qualification level we determine age-specific labor force participation rate based on the Micro Census data of 2005. This is again problematic for the group of young adults, because many of them attend school or other education institutions. From the information on the type of the education institution, we draw conclusions about the future qualification level. It is assumed that people attending a vocational school will acquire the corresponding level of qualification (vocational education). Similarly, students at colleges and universities are regarded as high-skilled persons (academic education). For people in general and secondary schooling, the qualification structure of the older Thuringians, between 30 years and 40 years, is again presumed. To determine the labor force participation rate of young adults, we assume that people currently attending

⁴ The Micro Census is a survey of socio-economic conditions in Germany, conducted by the Federal Statistical Office. The scientific use file employed in the present study covers approximately 0.7 percent of the population.

URL: <http://www.forschungsdatenzentrum.de/bestand/mikrozensus/index.asp>

any kind of education are not part of the labor force. The resulting age- and qualification-specific labor force participation rate is presented in Figure 2.

Figure 2:
Qualification-Specific Labor Force Participation Rate of the Thuringian Population in 2005 (Smoothed)



Source: Authors' calculations on the basis of German Micro Census 2005.

Almost 80 percent of the 20-year-old low-skilled persons are already part of the labor force. Until the age of 50 years, labor market participation fluctuates between 80 percent and 90 percent, strongly decreasing in the following years to 10 percent by age 63. Among the skilled persons group, the participation rate of the 25-year-olds is about 80 per cent and this increases in the following 10 years of age. At age 35-50 years, the labor market participation rate is around 95 percent and declines for older persons, similar to that of the low skilled. Among those with higher education, the labor force participation is only around 20 percent, even at age 65. At the age of 25 years the participation rate amounts to only about 10 percent, among the 30-year-olds to c. 60 percent, and it increases in the following three years of age to over 90 percent. This development reflects the much longer period of education in this group. Among high-skilled people between 30 years and 60 years of age, the labor force participation rate is about 95 percent.

To complete the labor supply forecast, we combine the projection of the total population with our estimates for the qualification structure and the age- and qualification-specific

participation rates. In doing so, we assume that the currently observed qualification structure and the labor force participation will not change in the forecast period.

Under these assumptions, a decline in total labor supply from approximately 1 153 million persons in 2009 to approximately 1 045 million in 2015 is expected. This development is largely driven by the decreasing supply of skilled persons. By 2015, the number of persons at this skill level reduces by approximately 88 000 to a level of 800 000 persons. This is a reduction of about 10 percent. The number of the high skilled reduces to a much lesser extent: 10 000 persons or 6 percent. In 2015, a labor supply of about 160 000 high-skilled persons is expected in Thuringia. The number of low-skilled persons decreases by about 10 000 – or 11 percent – to a level of approximately 90 000 persons in 2015. Whether this development implies a future “bottleneck” at the labor market, however, depends on the development of labor demand.

Future Labor Demand

Two factors influence the amount and the structure of desired recruitment in the future.⁵ First, the replacement demand, i.e., the demand due to the retirement of older employees, has to be considered. Secondly, the so-called expansion demand induced by structural changes, technical progress, and economic growth influences the number of employees required in the future. We assume that changes in sector structure of the Thuringian economy translate into changes in labor demand by professions, which can ultimately be associated with the three types of qualification considered above.

The first step is to identify the purely age-related replacement demand under status quo conditions, i.e., without taking structural changes into account. We determine the replacement demand on the basis of information provided by the Federal Employment Office (Bundesagentur für Arbeit) on the age structure of Thuringian employees in jobs covered by social security in 2007.⁶ Every year, compensation for retired employees is necessary. In the forecast period from 2009 to 2015, this is the case for all employees at the age of 55-63 years in 2007. The following considerations lead to the identification of this age group: The legal retirement age in 2007 is 65 years.⁷ According to information from the German Pension Fund (Deutsche Rentenversicherung) the actual retirement age in East Germany, however, is 63 years on average. Assuming that this retirement age remains constant during the forecast period, the replacement demand for the year

⁵ We abstract away from recruitment due to labor turnover prior to retirement age as our forecast is tailored to the macro-level.

⁶ Using figures for currently employed persons as the basis for prediction of the future labor demand implies the assumption of no labor shortage at present. The Bundesagentur für Arbeit provided us the relevant data.

⁷ The government decision to increase the retirement age to 67 years is implemented stepwise from 2012 to 2029 and is therefore negligible for the present forecast.

2009 contains all employees between 63 years and 65 years of age.⁸ For subsequent years, we assume that all retirement occurs at age 63. Overall, we expect an age-related replacement demand of approximately 89 000 in the 46 occupations considered (Table 1, column 1).⁹

In the second step, we assess the influence of structural changes, technical progress, and economic growth on future labor demand. In order to capture their impact, past growth rates of employment in the period 2003-2007 within each of eight economic sectors are extrapolated.¹⁰ Thus, changes in the relative importance of different sectors and the associated development of sector-specific labor demand are the basis for the projection of the expansion demand. In the forecast period, considerable shifts in the sector structure of the Thuringian economy are projected. The importance of the primary sector as well as the building & construction sector will further decline, while the tertiary sector becomes more relevant. For the manufacturing sector, too, an increasing number of employees is expected.

Assuming an invariant occupation structure within the sectors, the change-induced expansion demand by occupation can be determined. Overall, we expect a negative expansion demand of approximately 10 000 employees until the end of the forecast period. Summarizing the occupation-specific information on the previously identified replacement demand and the expansion demand yields the figure for 'net desired recruitment'. In the forecast period, this figure amounts to c. 80 000 persons. Table 1 presents the occupation-specific net desired recruitment as well as its constituent elements, replacement and expansion demand. Additionally, the table contains information on the net desired recruitment related to the stock of employees in 2007.

As one might have expected, the figures show large differences in the absolute amount of future demand among the occupation categories considered. Altogether, net desired recruitment is largely driven by age-related replacement demand. Related to the stock of employees in 2007, the demand concentrates on occupations with a large proportion of high-skilled employees, mainly in technical and engineering occupations as well as in the service sector.

⁸ To determine the number of employed older persons, the age-specific participation rates of 2007 are extrapolated to 2009.

⁹ In this application, the original occupation classification system of the Federal Employment Office is condensed into 46 categories.

¹⁰ We consider the following sectors: agriculture, forestry, fishing; mining, energy, water supply; manufacturing; construction; trade, hospitality, transportation; finance, industry related services; public administration; public/private services.

Table 1:
Occupation-Specific Future Labor Demand in Thuringia, 2009-2015

Occupation category	Replacement demand (1 000 persons)	Expansion demand (1 000 persons)	Net desired recruitment	
			(1 000 persons*)	related to stock 2007 (%)
Bankers, insurance sales agents	1.1	2.8	3.9	34.4
Protective service workers	2.7	0.7	3.4	30.8
Waste management and cleaning workers	2.8	1.6	4.3	26.3
Teachers	6.2	-1.3	4.9	25.7
Chemists, physicists, mathematicians	0.2	0.1	0.3	25.0
Managers, accountants	2.6	0.7	3.3	24.7
Engineers	2.5	0.8	3.3	24.3
Lawyers, judges, and related occupations	0.1	0.1	0.1	22.0
Physical technicians	0.6	0.4	1.0	20.8
Laborers	2.2	3.1	5.3	20.6
Engineering technicians	3.0	0.3	3.3	17.2
Journalists, translators, librarians, archivists	0.5	-0.1	0.4	17.0
Ministers, representatives, administrators	1.8	-0.5	1.4	17.0
Financial clerks, data processing specialists	2.2	0.6	2.8	16.6
Textile and clothing workers	0.6	0.1	0.7	15.2
Dispatching service workers	1.2	0.4	1.5	15.1
Chemical and plastics workers	1.1	0.4	1.6	14.3
Religious workers	0.1	0.0	0.0	13.8
Printing workers	0.2	0.1	0.3	13.3
Stock clerks, warehouse workers	2.3	0.2	2.5	13.1
Paper manufacturing and processing workers	0.2	0.1	0.3	13.0
Woodworkers	0.2	0.1	0.3	13.0
Housekeeping workers	0.5	-0.1	0.4	12.9
Stonemasons, glaziers, potters, and related occupations	0.5	0.2	0.7	12.7
Miscellaneous sales representatives, and related occupations	0.6	0.2	0.7	12.3
Social and natural scientists	0.2	0.1	0.3	12.0
Administrative support workers	13.0	-2.0	11.1	12.0
Metalworkers, mechanics, installers, toolmakers, and related occupations	8.4	1.3	9.6	11.4
Mining and extraction workers	0.1	0.0	0.1	10.5
Artists, designers, photographers, and related occupations	0.4	-0.1	0.3	9.9
Transportation workers	4.0	-1.2	2.8	9.1
Machine operators, and related occupations	1.0	-0.3	0.7	9.0
Food processing workers	1.9	-0.3	1.6	7.6
Social service workers and specialists	4.7	-2.6	2.1	6.5
Merchants, and related occupations	5.1	-1.7	3.4	6.3
Electricians, service technicians	2.0	-0.8	1.2	6.0
Communications operators	0.3	-0.1	0.2	5.2
Miscellaneous workers	0.5	-0.2	0.3	3.3
Agricultural and forest workers	2.6	-2.1	0.5	2.5
Furnishings workers	0.1	-0.1	0.0	1.6
Restaurant and hotel keepers, waiters, and related occupations	0.6	-0.5	0.1	1.4
Healthcare practitioners and supporters	4.6	-3.9	0.7	1.4
Cabinet and model makers	0.3	-0.3	0.1	1.1
Hair cutters, beauticians	0.5	-0.4	0.0	0.4
Painters, and related occupations	0.5	-0.6	-0.1	-2.0
Construction workers	2.3	-4.6	-2.3	-7.6
Overall	89.0	-9.5	79.6	11.0

* Rounding differences may apply.

Source: Authors' calculations based on Employment Statistics of the Federal Employment Office.

Labor demand is assumed to be unaffected by worker replacement requirements, so that changes in the stock of employees required can result only from expansion demand. In order to juxtapose qualification-specific labor demand and supply, we now concentrate on the three-category qualification scheme and the associated expansion demand. From the occupation-specific forecast of the expansion demand we can derive the development of future demand in the three levels of qualification. We assume that occupation-specific changes of the expansion demand will lead to proportional changes in the demand for each qualification level. In other words, the qualification structure within occupations is regarded as constant.

Labor demand will decrease in every one of the three qualification levels. In 2015, the demand for high-skilled and skilled workers is approximately 1 percent and 1.5 percent lower than at the beginning of the forecast period, amounting to c. 81 000 and 555 000 persons respectively. The reduction in demand for low-skilled persons is about 0.7 percent in the forecast period – to 75 000 persons in 2015.

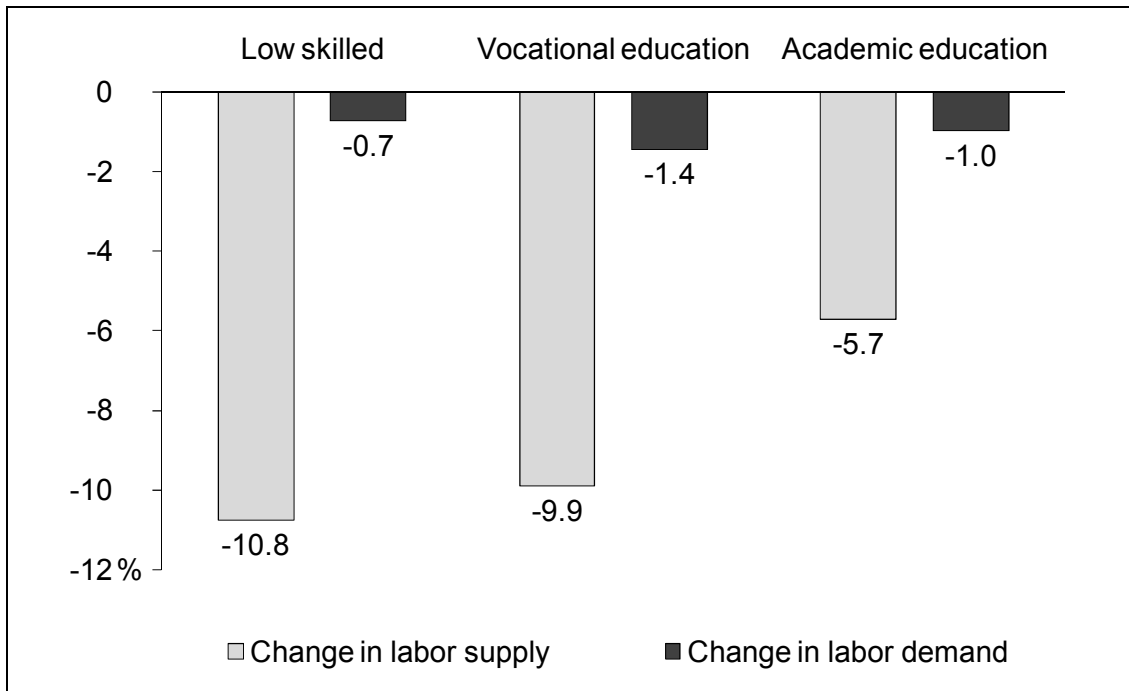
Future Labor Shortage in Thuringia?

When comparing the forecasts of demand and supply, one should keep in mind that the underlying data originate from data sources that apply different definitions of employment. The forecast of labor demand is based on information from the Federal Employment Office about employees in jobs covered by social security in Thuringia. This is a rather narrow definition of employment. It excludes civil servants, self-employed persons, workers in family businesses, persons in marginal part-time employment, and soldiers. The forecast supply, in contrast, applies the conventional definition of labor force and uses data taken from the German Micro Census for Thuringia, covering all employed persons and unemployed job seekers.

Due to the differing definitions of ‘labor’ in these forecasts, the resulting absolute figures are not directly comparable. However, it is possible to compare the expected changes in labor demand and supply by type of qualification (Figure 3). In the forecast period a reduction of the labor supply as well as the labor demand is expected. Due to the stronger decrease in labor supply, a trend towards a labor shortage in Thuringia is identified. Considering that labor supply includes unemployed job seekers, and unemployment is high, a quantitative labor shortage is not expected in either qualification level until the end of the forecast period.

A comparison between the qualification levels might lead to the conclusion that the relative labor market position of low-skilled employees will improve in the future. However, this group has by far the highest unemployment rate. Instead, the gap in the growth rates for the numerically largest group, skilled labor, must be considered as the most serious challenge for the economy of Thuringia.

Figure 3:
Forecast of the Development of Qualification-Specific Labor Demand and Supply in
Thuringia, 2009-2015
- Growth Rates in % -



Sources: Authors' calculations on the basis of Employment Statistics of the Federal Employment Office and German Micro Census 2005.

3 The Perspective of Firms

We switch the perspective from the ‘objective’ analysis based on official statistics to the (subjective) perceptions of firms regarding current and future recruitment problems.

Hitherto Observed Problems

Against the backdrop of very favorable business conditions in previous years, one might expect that firms experienced difficulties in hiring skilled workers in Germany as a whole. The intensity of such a bottleneck may not be homogenous across regions in the case of imperfect labor mobility. Considering the high unemployment rates following the economic transformation of the 1990s, it is not obvious that skilled-labor shortages existed in the East German federal states, particularly in Thuringia, in the recent past. A common procedure in the literature is to assemble indicators from aggregated register data (Veneri 1999). However, there is no clear-cut criterion for labor shortages in such an approach, and usually vacancies are difficult to measure as not all of them are necessarily reported to labor offices. In contrast, we resort to two sources of disaggregated data at the level of firms or establishments: the *IAB establishment panel* and a survey of firms in Thuringia conducted by IWH in 2008 (Bellmann 1997; Buscher et al. 2008).

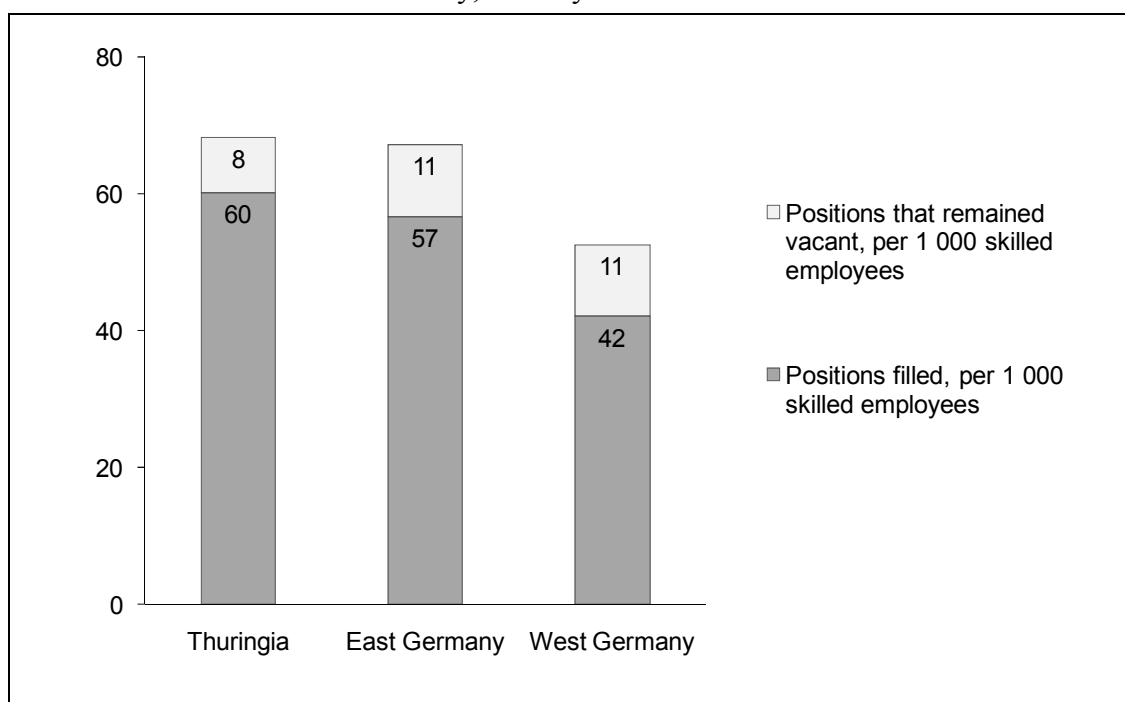
The *IAB establishment panel* is a representative, annual survey of establishments in Germany covering all industry sectors.¹¹ The 2007 wave places special emphasis on recruitment of skilled workers. In addition to the number of skilled employees hired in the first half of 2007, the data contain the number of positions for skilled workers that could not be filled in the same period. We define the “gross desired recruitment intensity” as the sum of these two components per 1 000 employed skilled workers.¹² Compared to the previous discussion of business expansion and retirement as reasons for net desired recruitment, labor turnover prior to retirement age would constitute an additional motif for firms’ recruitment demands. A regional comparison shows that the total recruitment intensity in Thuringia (68 per 1 000 skilled employees within six months) is similar to the respective value for East Germany as a whole, and exceeds the West German level by more than a quarter (Figure 4). Within Thuringia, firms in agriculture/mining and the building sector had above-average recruitment intensity, whereas in West Germany the service sector played a pivotal role. Breaking down the recruitment intensity amount reveals that 11 vacancies per 1 000 skilled employees could not be filled in both East and West Germany, with a somewhat lower figure for Thuringia. The share of filled vacancies is somewhat higher in Thuringia (88%) than in East Germany as a whole (84%) or West Germany (80%). This suggests that firms in Thuringia have faced fewer problems

¹¹ URL: <http://www.iab.de/en/erhebungen/iab-betriebspanel.aspx/>

¹² As the stock of skilled employees is not available for the beginning of the period considered, we use the June 2007 value instead.

than average in finding skilled personnel in the recent past. However, this observation cannot necessarily be carried over into the future, as the demographic change affects Thuringia more rapidly than West Germany.

Figure 4:
Gross Desired Recruitment Intensity, January-June 2007



Source: Authors' calculations on the basis of IAB establishment panel 2007.

Personnel Management Policies in the Context of Expected Problems

In order to investigate expected hiring problems and potential countermeasures by firms with a longer time horizon, we use data from the IWH survey on firms in Thuringia. Interviews covering *c.* 1 000 firms were conducted with human resource managers or CEOs in June and July 2008. The survey was designed to cover the most important industry branches of the state; these industries comprise about two-thirds of total employment. Company names were sampled from the Markus *Creditreform* database, stratified by industry branch and three differently sized classes.¹³ The questionnaire covers current personnel policies, training activities (apprenticeships, further education), expectations about changes in the size of the firm's staff, problems in recruiting workers, and planned expansion of programs in the context of personnel management (Table 2).

¹³ URL: http://www.creditreform.de/Deutsch/Creditreform/FAQ/Direktmarketing/Firmenprofile_MARKUS

Table 2:
Composition of the Regression Sample ($n = 944$)

Variable	Mean	Variable	Mean
Number of employees (<i>natural log.</i>)	2.77	Industry: Food production	9%
Problems expected when hiring workers?	61%	Metal production and processing	15%
Share of workers aged 55+	14%	Electrical/precision engineering, optical industry	12%
Employment outlook: decreasing	10%	Commerce and repairing	13%
stable	49%	Transport and communication	12%
increasing	41%	Business services, real estate, leasing	14%
Share of workers with college education	18%	Health and social services	12%
Share of master craftsmen	7%	Mechanical engineering	10%
Current vacancies?	34%	Miscellaneous industries	3%
Crafts company?	41%		

Source: IWH survey on firms in Thuringia, 2008.

We are interested in the association between these management policies and company characteristics, especially the expected incidence of problems in hiring workers in the future. Our “problems” variable is a binary response to the following question: “do you expect problems finding adequate applicants for vacancies within the next five years?” No less than 61 percent of the interviewed firms answered in the affirmative. In order to ascertain whether the perception of problems varies by company characteristics, we estimate a probit regression model. We consider the following company characteristics – which will also be used in consecutive regression equations:

- employment structure (number of workers, age, share of highly qualified staff),
- employment dynamics (current vacancies, five-year outlook),
- type of business (branch, crafts).

We expect that larger firms are more likely to run into problems because of a higher labor turnover and therefore more frequent hiring processes. Similarly, firms with older employees may have higher replacement incentives, and those with greater human capital intensity may face greater difficulties when replacing highly qualified workers if this group is in short supply and cannot be trained within the firm. We define proxies for age structure as the share of workers aged at least 55 years, and for human capital intensity as the share of workers with college education or a master craftsman degree. Furthermore, firms that plan to expand their workforce or already have vacant positions may have a greater probability of experiencing problems. Based on the previous argument of this study, one might also expect differences across the industry spectrum.

The regression results do not support all of our hypotheses (Table 3, column 1). However, current vacancies have a strong effect, with the expected sign: the estimated coefficient of 0.77 translates into a 27 percentage points difference of anticipating problems (at the mean of all other variables). Industry categories, too, affect the expectation of

problems, with particularly high rates in mechanical engineering and the metal production industry, which corroborates our occupation-level forecasts of (relative) net desired recruitment. We do not find evidence for elevated problem awareness among crafts companies, though. The impact of employment level is modest: starting from the sample average of the logarithm of employees and averages for other variables, 10 further employees increase the probability of anticipating problems by 1.5 percentage points.

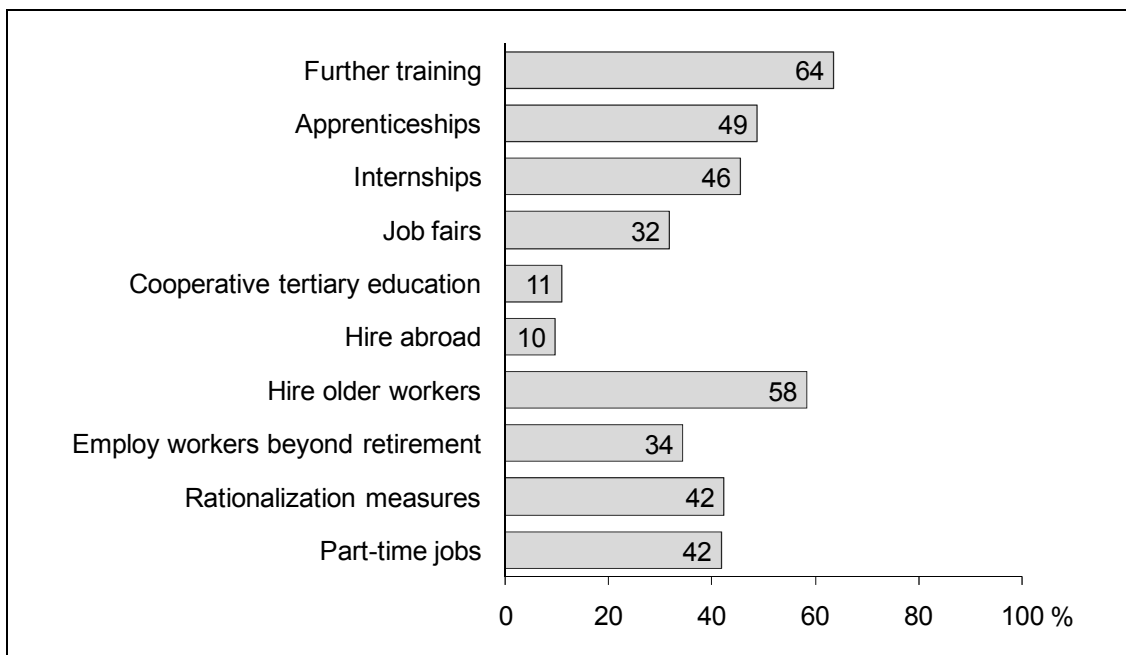
Awareness of problems in the near future may affect the willingness to implement certain personnel management programs tailored to secure the firm's human capital base. We first consider whether three programs are already in progress at the time of the survey: training of apprentice(s), further training, and fringe benefits. About half of the firms in our sample currently have at least one apprentice or pay fringe benefits, while three-quarters conduct further training measures on a regular basis (Table 3, columns 2-4). While expected problems seem to be unrelated to training efforts, there is a strong association between expected problems and the payment of fringe benefits, with a marginal effect of 12 percentage points. Considering the composition of the workforce, we find that firms with a higher share of older workers are less tempted to offer perks. A large share of employees with college education predicts a lower probability of training apprentices and higher probabilities of regular further education programs and of fringe benefit payments. Positive employment outlook affects perks only, with marginal effects of +16 and +14 percentage points for planned expansion of employment and at least one currently vacant position, respectively. While metal-producing and mechanical engineering firms have a particularly high tendency to invest in training apprentices, the health sector has the highest probability of regular further training activities, which may be related to legal requirements in this field. No clear pattern emerges for fringe benefits. We also find no meaningful differences across the implemented personnel management policies under consideration between crafts companies and the remaining firms.

We now turn to programs that firms planned to implement or expand within the five years following the survey. Figure 5 plots the sample frequencies regarding 10 selected measures that might prove useful in recruiting workers (apprenticeship, internship, job fairs, cooperative tertiary education, hire from abroad, hire of older workers), increasing employee loyalty (further training, employment of workers beyond retirement age, part-time jobs), or downsizing labor demand. The bars indicate the percentage of firms that plan either to introduce such measures or to expand their efforts in these fields. The most frequently quoted strategies refer to further training and hiring of older workers. These two measures appear to be a sensible response to the imminent demographic changes in labor supply. Again, we estimate binary probit models to unveil the present determinants of future personnel management strategies (Table 4). The probability of conducting such plans is, in most cases, positively associated with firm size and the expectation of problems. The prospect of an increase in labor demand predicts a higher probability of introducing or expanding six of the measures considered. While crafts

companies do not differ from other firms in most cases, they are less inclined to hire older workers for their workshops.

The fact that more than half of the firms in the industries considered express the fear that they will have problems in filling vacant positions in the near future could be a sign of a tightening labor market for skilled workers.¹⁴ While many of the firms anticipating such problems have already planned reaction strategies to absorb the changes in the demographic composition, some firms may not yet be aware of their future challenges. The strategies cited here all belong to the sphere of the firms. However, they could also be supported or complemented by government action, chambers of commerce, and similar organizations, and we conclude by making some final recommendations for policies to address these issues.

Figure 5:
Percentage of Companies with Planned Expansion of Programs in the Context of Personnel Management



Remark: Multiple responses possible.

Source: IWH survey on firms in Thuringia, 2008.

¹⁴ Obviously it would be desirable to have comparative figures not only for other regions but also for earlier time periods within Thuringia in order to quantify the magnitude of this trend.

Table 3:
Binary Probit Model Coefficients on Expected Problems and (Selected) Implemented Personnel Management Policies

	Problems expected?	Implemented personnel management policies		
		Apprenticeship	Further training	Fringe benefits
Problems expected?				
Yes		0.09	0.04	0.30 ***
No		<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Share of workers aged 55+	-0.30	-0.52	0.01	-0.45 *
Employment outlook:				
decreasing	-0.21	0.21	0.17	0.00
stable	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
increasing	0.15	-0.17 ***	-0.05 ***	0.39 ***
Share of workers with college education	0.08	-0.60 ***	0.95 ***	0.36 *
Share of master craftsmen	0.08	0.42	0.38	-0.30
Current vacancies?				
Yes	0.77 ***	-0.03	0.17	0.35 ***
No	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Number of employees (<i>natural log.</i>)	0.08 **	0.68 ***	0.14 ***	0.08 **
Industry:				
Food production	-0.70 ***	-0.13	0.04	0.33 *
Metal production and processing	-0.15	0.19	0.16	0.04
Electrical/precision engineering, optical industry	-0.59 ***	-0.24	0.39 **	0.31 *
Commerce and repairing	-0.59 ***	-0.10	0.52 ***	0.17
Transport and communication	-0.25	-1.00 ***	0.26	0.31
Business services, real estate, leasing	-0.55 ***	-0.43 **	0.48 **	0.11
Health and social services	-0.26	-0.69 ***	1.52 ***	0.15
Mechanical engineering	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Miscellaneous industries	-0.35	-0.04	0.91 ***	0.03
Crafts company?				
Yes	-0.02	0.15	-0.05	-0.03
No	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Intercept	0.20	-1.57 ***	-0.31	-0.76 ***
<i>n</i>	944	944	931	932
Pseudo-R ²	0.115	0.309	0.094	0.078

Notes: *** / ** / * indicate statistical significance at the 1% / 5% / 10% levels respectively, based on heteroscedasticity-robust standard errors.

Source: IWH survey on firms in Thuringia, 2008.

Table 4:
Binary Probit Model Coefficients on Planned Expansion of Programs in the Context of Personnel Management

	Further training	Apprenticeships	Internships	Job fairs	Cooperative tertiary education	Hire abroad	Hire older workers	Employ workers beyond retirement	Rationalization measures	Part-time jobs
Problems expected?										
Yes	0.29 ***	0.21 **	0.25 ***	0.22 **	0.29 **	0.20	0.46 ***	0.27 ***	0.07	0.22 **
No	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Share of workers aged 55+	-0.57 **	-0.31	0.00	-0.24	-0.26	0.60 *	0.24	0.97 ***	-0.16	-0.17
Employment outlook:										
decreasing	-0.04	-0.08	-0.27 *	-0.23	0.43 *	0.33	-0.16	-0.15	0.37 **	0.24
stable	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
increasing	0.14	0.31 ***	0.23 **	0.24 **	0.39 ***	0.19	0.28 ***	0.22 **	0.03	0.11
Share of workers with college education	0.03	-0.61 ***	0.38 **	0.89 ***	1.05 ***	0.75 ***	-0.24	-0.14	-0.05	-0.02
Share of master craftsmen	0.20	0.20	0.52	0.14	0.22	0.02	0.33	0.48	-0.08	0.24
Current vacancies?										
Yes	-0.08	-0.05	-0.02	0.06	-0.01	0.75 ***	0.19 *	0.09	0.01	-0.20 **
No	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Number of employees (<i>natural log.</i>)	0.21 ***	0.16	0.20 ***	0.34 ***	0.32 ***	0.10 *	0.08 **	-0.02	0.21 ***	0.11
Industry:										
Food production	0.15	0.25	-0.10	0.25	-0.67 **	-1.07 **	0.15	-0.12	0.29	0.58 ***
Metal production and processing	0.07	0.35 **	0.11	0.16	-0.11	-0.03	0.02	0.07	0.23	0.41 **
Electrical/precision engineering, optical industry	0.39 **	0.37 **	0.16	0.22	-0.17	-0.17	-0.04	0.04	0.13	0.56 ***
Commerce and repairing	-0.09	-0.15	-0.20	0.23	-0.42	-0.20	-0.02	-0.07	-0.35 *	0.54 ***
Transport and communication	-0.17	-0.36 *	-0.17	-0.06	-0.55 *	-0.24	0.37 *	0.32 *	-0.12	0.57 ***
Business services, real estate, leasing	-0.12	-0.06	-0.17	-0.23	-0.38	-0.06	-0.02	0.14	-0.16	0.58 ***
Health and social services	0.37 *	0.06	0.09	0.13	-0.42 *	-0.01	-0.16	0.11	-0.11	0.85 ***
Mechanical engineering	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Miscellaneous industries	0.20	0.20	0.33	0.34	0.11	-0.55	-0.27	0.16	0.06	0.39
Crafts company?										
Yes	0.05	0.00	-0.15	0.05	-0.12	0.04	-0.28 ***	-0.11	0.05	-0.03
No	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Intercept	-0.44 **	-0.65 ***	-0.92 ***	-1.97 ***	-2.53 ***	-2.35 ***	-0.34 *	-0.80 ***	-0.86 ***	-1.13 ***
<i>n</i>	934	934	934	934	934	934	934	934	934	934
Pseudo-R ²	0.084	0.095	0.087	0.134	0.170	0.166	0.079	0.039	0.070	0.037

Notes: *** / ** / * indicate statistical significance at the 1% / 5% / 10% levels respectively, based on heteroscedasticity-robust standard errors.
Source: IWH survey on firms in Thuringia, 2008.

4 Policy Recommendations and Conclusions

We present our policy recommendations for an array of key-actors involved in the design of institutional settings of the local labor market. The suggested measures have been devised to help maintain the competitiveness of the Thuringian economy and foster economic growth. While currently a shortage of qualified workers is not a pressing issue, the present situation is unlikely to be sustainable in the light of population ageing. As our survey suggests, many firms anticipate problems related to hiring skilled workers in the near future, and seek to implement appropriate countermeasures. The short time-frame available to policy making at the different institutional levels needs to be used efficiently if measures are to be set up to alleviate the problem of shortages in skilled labor in the future.

We group our policy recommendations in three categories: the first category can be headed as “activating existing potentials in the labor market”; the second one has a medium-term horizon and relates to “education and vocational training programs”; and the third category is basically an “information and consulting strategy”, directed at firms as well as employees and young people deciding about their future careers. It is useful that the key-actors cooperate and coordinate their behavior, and a combination of the strategies may provide better outcomes than an isolated strategy.

On average, Thuringian employees are older than those in Germany as a whole. This indicates a risk for firms continuing their business in the coming years, as it implies higher replacement demand when at the same time the number of young people entering the labor market drops significantly. This situation calls for the activation of three important human-capital resources for Thuringia: first, there is a large number of commuters who live in Thuringia and work in neighboring states. There are signs that a large portion of these commuters are willing to pick up a job in Thuringia, given that the work conditions are acceptable. Secondly, female full-time employment could be increased. A prerequisite for using this resource calls for a reconciliation of work and family, which has to be supported by both the company and municipal authorities (e.g., full-time kindergarten and elementary school programs, flexible working hours, parenting-oriented personnel management programs). Thirdly, the large number of unemployed young adults and long-term unemployed people could be accessed as potential resources. Reactivation strategies, modularly organized requalification programs, might be helpful tools for a successful integration of these groups into the local labor markets.

Compared to West Germany, firms in Thuringia do not consider immigration of foreigners as a preferred strategy for overcoming the possible threat of skill shortage (Buscher et al. 2008). Our forecast indicates the greatest demand is in the group of workers with a vocational education (rather than academics), and for this group the in-

come hurdle associated with the current national immigration regulations appears much too high.

The second category of policies deals with education in a broader sense, including teaching at schools, universities, and vocational training. Even though Thuringia has reached a top position among German states in the PISA survey of the OECD, the state shares many of the deficiencies of the German school system: low permeability, the missing link between secondary school and the “world of work”, and a considerable drop-out rate (7 percent of all pupils in Thuringia). Possible actions in this field include an upgrading of kindergarten education to lay the foundations for equal learning opportunities upon entering regular elementary schools. Such programs have shown to be effective in increasing student performance in later grades (Heckman 2000). Considering the high demand for engineering professions and the natural sciences, it would be reasonable to stir the curiosity of children (of both sexes) in these fields and thus to motivate them to follow a related career path.

The third category of measures is “information and consulting strategy”. Small firms are often confronted with limited financial buffers, making it difficult for them to deal with uncertain future events. Limited financial resources may also lead to some restrictions in the context of offering wage premiums to attract qualified employees. Yet, there might be a chance of overcoming this disadvantage by offering different perks. Among others, one might think of flexible working-time arrangements, parental-related employment conditions with childcare facilities, but also partly participation in the decision process of the firm, and medium-term perspectives of job protection. After all, there is a need to acknowledge that employees are a useful resource for the firm rather than just being part of the cost structure. In addition, some small firms are unable to offer apprenticeships because their work tasks do not cover all the training requirements for obtaining a vocational degree. Training networks across firms in partnership with educational institutions and chambers of commerce and industry provide a promising tool for overcoming such obstacles. Some arrangements of this kind have existed in the recent past as an instrument to address a shortage of apprenticeship positions supplied. While the market conditions for apprenticeships are turning into the opposite, support for such networks should be maintained into the future to help small firms meet their skilled-labor demand.

Another problem related to information deficits is the high drop-out rate of vocational training: 21 percent in 2007. This rate indicates that a large number of pupils have unrealistic expectations about their future job. However, this figure is also an indication of not yet fully used potentials in the field of vocational choice counseling. Here it seems necessary to install networks which inform pupils early about the requirements of the occupations they want to practice in the future. Such networks should involve vocational schools, firms, parents, and members of labor agencies. They should offer a wide range of possibilities for gaining practical experience to understand the requirements in

various occupational fields and compare them with their personal preferences and talents.

As we have laid out, there exist a couple of strategies that could be initiated by local government and other key-actors within and outside the sphere of the firm to prepare the Thuringian economy for the impending repercussions of demographic change.

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