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Wage Determination and Employment in Sweden Since the Early 1990s – Wage Formation in a New Setting

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Working Paper No. 236

**“Wage Determination and Employment in Sweden
Since the Early 1990s – Wage Formation in a New
Setting”**

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**Wage Determination and Employment in Sweden since the early 1990s –
Wage Formation in a New Setting[#]**

By

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1. Introduction

Much of what is called the “Swedish Model” has to do with Sweden’s labor market institutions, which are far different than those of the United States. Simplifying only slightly, wage and employment outcomes in the U.S. are mainly the result of decentralized decisions by buyers and sellers of labor services. Less than 8 percent of American private sector workers belong to labor unions, while government intervention and participation in the labor market is comparatively small.¹ Sweden represents the opposite extreme. In Sweden over 80 percent of workers belong to labor unions. Thus wages and working conditions for the vast majority of Swedes are the negotiated outcomes of collective bargaining agreements, which have had some uniquely Swedish characteristics that we describe below. And the Swedish government is a major labor market actor. By 1990 the public sector accounted for one-third of all jobs in Sweden, compared to only 15 percent in the U.S. The government also supports an extensive set of labor market policies and programs meant to maintain full employment while facilitating human capital formation and labor mobility. Last, Sweden’s large public sector implies high taxes on labor incomes—Swedish taxes are typically over half of GDP, nearly double the share in the U.S.

These features of the Swedish labor market evolved over roughly four decades, from the 1940s to the 1970s. And by the mid-1970s Swedes enjoyed one of the world’s highest living standards along with the most egalitarian income distribution of any advanced country. Poverty had been largely eliminated, and conventional measures of economic and labor market performance were enviable—the unemployment rate fluctuated around 2 percent, while average wage and productivity growth met or exceeded the average for developed countries.² In concert with other welfare state policies, it appeared to many that the “Swedish

¹ Even at its peak during the 1950s, union coverage in the U.S. never exceeded 35 percent. Private sector unionism has been in steady decline since. Union coverage has increased only in the public sector, where roughly 36 percent of workers now belong to unions. Government intervention in labor markets has increased over time, mainly as a result of workplace regulations and erosion of the “employment at will” doctrine that has historically characterized much of U.S. employment relations. Public employment as a fraction of total employment remains low by international standards.

² See Lindbeck (2000) for a discussion.

Model” of labor markets was an effective mechanism for delivering long run prosperity and employment opportunities. It seemed the “equity-efficiency tradeoff” was not so important, at least in Sweden.

Doubts began to emerge in the late 1970s. Sweden’s relative economic growth slowed, especially after 1975, while burgeoning welfare state institutions greatly increased the tax burden on the typical worker. The ratio of wage costs to disposable (after taxes) income per hour worked exceeded 4-to-1 in the 1980s—in fact real disposable wages per hour worked did not grow at all from 1975 to 1993, in spite of rising pre-tax wages and productivity.³ Nearly all employment growth after 1970 was due to the rapid expansion of public sector jobs for women, which fueled rising female labor force participation. Private sector employment stagnated. On the collective bargaining front, large employers became progressively disillusioned with the redistributive and distortionary aspects of centralized bargaining, which had greatly compressed the wage distribution. The employers’ confederation SAF abandoned its support for centralized bargaining in the 1970s, and the system began to unravel in 1983 when large industrial employers negotiated separate agreements with their unions.⁴

Concerns with the Swedish model peaked with the economic crisis of the 1990s. Buffeted by a perfect storm of international recession, a banking crisis and unsustainable public spending—which had risen above 70 percent of GDP—both private and public employment fell. The employment rate of working age Swedes declined by over 12 percentage points between 1993 and 1997, a reduction in overall employment of about 500,000. “Open” unemployment—which excludes jobless individuals enrolled in public retraining and other programs—reached nearly 10 percent. The Swedish labor market was no longer anyone’s envy. Both the present and future of Swedish prosperity seemed at stake, along with faith in the Swedish Model itself.

³ On real wages and productivity see Edin and Topel (1997) Figure 4.5. On labor supply see Burtless (1987) and Aronsson and Walker (1987).

⁴ We describe the evolution of centralized bargaining in greater detail below. The last central frame agreement was negotiated in 1987, though it seems to have had little effect. SAF closed its collective bargaining unit in 1990.

This paper is a follow-on to the analysis of Edin and Topel (1997), which was written in the midst of the crisis. Edin and Topel analyzed the allocative effects of labor market institutions and policies in Sweden over a period of roughly 30 years, and drew implications for the future performance of the Swedish labor market. Among their conclusions were the following:

1. *Centralized Bargaining and Wage Compression.* Centralized bargaining had been an important contributor to wage compression, resulting in wage disparities that were smaller than what would have been generated by market forces or even decentralized collective bargaining. This compression had lasting effects on the structure of the Swedish economy and labor market: low wage sectors and low-wage employers were priced out of existence, while large industrial employers of skilled labor were subsidized. For a time, artificially high wages for less skilled workers did not result in higher measured unemployment.
2. *Wage Compression, Taxes and Efficiency.* The artificial compression of wage differences distorted incentives on many margins, affecting decisions to work, to employ and to invest in productive skills. These distortions were magnified by the large tax wedge generated by high income, payroll and value-added taxes. For skilled workers the combined effect of these taxes meant that discretionary income fell to only 21 percent of pre-tax wages, which were already artificially low. Of particular concern for long run productivity, the private returns to investments in human capital—such as schooling—were unusually low. And low returns appeared to adversely affect human capital investment.
3. *Labor Market Policies and the Public Sector.* Much of Sweden's large public sector is devoted to the maintenance of full employment. Yet active labor market policies (ALMP) had little impact on unemployment or on subsequent productivities of

participants. Although the rapid expansion of public sector jobs did not have much (direct) impact on employment of men, the growth of the public sector helped raise and maintain the labor market fortunes of women—virtually all of the post-1970 increase in women’s employment was due to the expansion of the public sector. Women’s wages and labor force participation converged toward those of men, in part, because the public sector would employ whatever labor supply was forthcoming at the chosen public sector wage.

If egalitarian policies raised the wages of the least skilled and displaced substantial employment, why didn’t those policies also generate widespread unemployment? Edin and Topel attributed part of the answer to the rapid growth of public sector employment, though that explanation did not seem especially satisfying for men. To resolve this puzzle Edin and Topel constructed a simple model that rationalized the major “facts” about pre-crisis labor markets in Sweden—including wage compression, migration and restructuring—along with the ultimate demise of centralized bargaining in the 1980s.

In their analysis, centralized bargaining and associated egalitarian policies delivered short-run rents to skill-intensive sectors. Consistent with the goals of LO economists who had advocated wage compression in the 1960s, skill and capital intensive sectors of the economy expanded, while “low-wage” jobs were priced out of existence. Inefficiencies caused by distorted wage setting mounted over time, however. Sweden’s wage and income compression was “swimming against the tide” of technological changes that favored rising relative wages of skilled labor, so that incentives to invest in skills were reduced at exactly the time that skilled labor became more valuable. The result was an ever-worsening skills shortage, which impeded human capital formation and economic growth. In the longer run it became progressively more difficult for employers to hire skilled labor precisely because skills were artificially cheap—which is what may have caused employers to ultimately reject centralized bargaining. For these and other reasons Edin and Topel concluded that somewhat greater income inequality would have a first order impact on economic efficiency and prosperity, but

only a minor impact on equity. In their view, a little more inequality would be a small price to pay for improvements in labor market performance.

We return to many of the same issues studied by Edin and Topel – but with the advantage of hindsight and the challenge of a greatly changed economic environment. We address two broad questions. First, how did Swedish policies and institutions adapt to the crisis? Second, were these adjustments and their effects consistent with the earlier analysis of Edin and Topel?

With regard to the first question, the central fact documented below is that economic forces in general, and the crisis in particular, have forced some relaxation of Welfare State policies and constraints. The result is a move toward, but not to, decentralized market outcomes. The most prominent symptom is that wage inequality increased substantially. Most of this increase occurred at the top of the wage distribution, so that skill differentials among the most skilled increased. Among the least skilled and least educated wage disparities did not increase much at all—negotiated wage minima are still the rule in collective bargaining contracts—which apparently caused employment to take up the slack. With declining demand for less skilled labor, and increased supply from a surge in low-skill immigration, relative employment rates of the least skilled fell sharply in the 1990s, and did not recover.

Coincident with the rise in wage inequality, the importance of the public sector as a source of employment has diminished. In the 1980s government jobs accounted for over 40 percent of all employment in Sweden, peaking at 43 percent in 1993. That fraction steadily declined thereafter, reaching about 35 percent in 2001. This evidently reduced overall labor demand—though private sector employment increased as part of the recovery, the employment to population ratio is roughly 8 points lower today than it was in 1990.

Are these outcomes consistent with the analysis offered by Edin and Topel? At a broad level, we believe they are. Edin and Topel argued that Welfare State institutions greatly

affected the employment and productivity landscape in Sweden. Skill differentials in wages and incomes were artificially compressed, which benefited employers of skilled labor for a time, but which produced ever-increasing distortions as (a) technical progress raised the demand for skilled labor, while (b) small returns to human capital investment discouraged Swedes from becoming skilled. Less skilled workers benefitted from the excess demand for skilled workers, and from the growing public sector, so unemployment remained low. But market fundamentals eventually forced a retreat—the public sector shrank, taxes fell and centralized bargaining gave way to more decentralized negotiations. The attendant rise in inequality was part of an overall move toward lower distortions, which improved efficiency, incentives and economic performance.

The impact on egalitarian outcomes has been relatively minor, however. Even today, labor market outcomes in Sweden are the most egalitarian in the developed world and, unlike in the U.S., post-crisis productivity increases have benefitted both high and low wage workers. Given the modest increase in inequality that has occurred, and its apparent benefits, Edin and Topel's original conclusion may still apply—a little more inequality might go a long way—especially because one can reasonably argue that the “efficiency price” of a set of egalitarian is even greater today than it was in 1990.

The paper is organized as follows. By way of background, section 2 offers a brief account of the setting. For a variety of reasons, wages in Sweden are set in a very different environment today than twenty or thirty years ago. Section 3 documents the evolution of wage and employment differentials since the early 1990s. Section 4 addresses the link between wage policy and skill formation. In section 5, we turn to the other end of wage distribution and examine the link between wage compression at the low end of wage distribution and the employment prospects of the less-skilled. Section 6 concludes.

2. The (New) Setting

A stylized description of the Swedish labor market in the 1970s and early 1980s is as follows. More than 80 percent of Swedish workers were members of labor unions, so that wages and working conditions were largely the result of collective bargaining. A key feature was that the negotiations were “centralized”—wages and working conditions were spelled out in central “frame agreements” negotiated between the Swedish Employers Federation (SAF) and labor unions representing blue collar (LO), white collar (TCO) and professional (SACO) employees. Centralized bargaining was the key institutional feature that promoted egalitarian outcomes; for example, between 1970 and 1983 the log wage difference between blue collar workers in the 90th and 10th percentiles of the wage distribution fell by over 40 percent. (Hibbs, 1990).

Centralized bargaining started to crumble in 1983 when Verstadsföreningen—which represented such large employers as ABB, Saab and Volvo—negotiated outside the LO/SAF frame and reached a separate agreement with the largest industrial union, Metall. This began a trend toward more decentralized wage setting, though still firmly within a framework of collective bargaining. There have been further changes to wage formation subsequently. Yet unionization rates remain high and collective bargaining features as prominently today as prior to the demise of centralized bargaining in the 1980s.

In 1980 about 10 percent of the working-age (20-64) population was foreign-born. The majority of immigrants (almost 60 percent) came from other Nordic countries, which have similar cultures and institutions, and which are similarly developed; see Edin and Fredriksson (2000). About 15 percent of the Swedish working-age population had a university degree, while 48 percent of the population had compulsory education. Years of completed schooling for the average Swede were lower than for the average American worker, but higher than the EU average (Wasmer et al, 2007)

In the beginning of the 1990s, Sweden experienced its most severe macroeconomic shock since the Great Depression. Around the same point in time, Sweden entered the EU, successfully curbed inflation, reduced government's share of national output, and started to deregulate many markets. The educational attainment of the Swedish population continued to increase and immigration flows, driven mainly by less-skilled refugees from outside the OECD, reached post-war highs. This shift in the skill composition of immigrants has put further pressure on egalitarian wage policies: by 2003, these non-OECD immigrants accounted for roughly 15 percent of low-wage workers, which is roughly similar to the concentration of immigrants among low skilled workers in the U.S.

It is fair to say that wages are set in a very different environment today than twenty or thirty years ago. Our purpose in what follows, is to describe this environment in greater detail. We begin with the macroeconomic setting, followed by a description of changes in population and labor force demographics. Finally, we describe the changes in the institutional set-up for wage formation.

2.1 Aggregate Developments since the Early 1990s

Beginning in the early 1990s Sweden experienced its most severe economic downturn since the 1930s. In just three years (open) unemployment rose from two percent to almost ten percent of the labor force.

The “crisis” of the early 1990s is readily visible in Figure 1, which illustrates the evolution of the employment-to-population ratio among 16-64 year-olds from 1976-2004. After rising steadily from the 1970s to 1990, the ratio dropped by more than 10 percentage points between 1990 and 1992 (from 83.1 percent in 1990 to 72.6 percent in 1992). Employment continued to decline until 1997—the overall peak-to-trough decline in the employment rate was about 12 percentage points—and since then has recovered only slightly. Even after 14 years, by 2004 the overall employment rate remained more than 8 percentage points below its 1990

peak. This fact alone suggests that the very high employment rates of the late 1980s were an artificial construct of Welfare State policies rather than the result of market fundamentals.

Figure 1: Employment rate among 16-64 year-olds, 1976-2004, percent

Source: Labor Force Surveys

The shock of the early 1990s hit the manufacturing sector first, leading to a decline in private sector employment that started in 1990. Manufacturing employment fell by 240,000 jobs between 1989 and 1993—a decline of 26 percent. Figure 2 shows that the ratio of overall private sector employment to the working age population fell by about 7 percentage points between 1990 and 1993. More permanent cutbacks in the size of the public sector followed—the public-employment to population ratio fell from 31 to 23 percent between 1990 and 1997—a decline of 26 percent—and did not subsequently rebound. Notice that the overall decline in the employment to population ratio—shown in Figure 1—is mainly due to the contraction of the public sector. Private sector employment as a share of the population returned to its pre-crisis level. The public share of total employment has thus ratcheted down, and with it the impact of the welfare state on overall labor demand.⁵ In the late 1980s the Swedish private sector accounted for just more than half of total employment, and for less than half during the crisis of the early 1990s. By 2004 the private sector share had increased to nearly two-thirds. In this respect the developments of the 1990s are very different than in the preceding two decades when the public share of total employment steadily increased, accounting for virtually all of net job creation between 1970 and 1990 (Edin and Topel, 1997; Rosen, 1997).

Figure 2: Private and public sector employment, 1987-2004, percent

Source: Labor Force Surveys

⁵ Some of the decline in the public sector is due to privatization of some public sector activities. The decline in the share of public to total employment is certainly real, however. Even under the extreme assumption that the entire decline in the public sector is due to privatization, this would only account for half the increase in the private sector.

An important macroeconomic development is that Sweden successfully curbed inflation during the 1990s. From 1971 to 1990, annual inflation averaged 8.5 percent. In 1990, the rate of change in the CPI reached 10.5 percent, its highest level since 1980-81.. It fell sharply during the crisis years and has averaged just 1.3 percent since 1994. Despite relatively solid employment growth between 1998 and 2001, inflation has generally remained within the bands stipulated by central bank's inflationary target (2 ± 1 %), with the only exceptions since 1994 occurring when inflation was below 1 percent in 1996-2000 and 2004-2005.. This low-inflation regime was presumably achieved via a combination of a more restrictive monetary policy – implemented by an independent central bank – a rapid worsening of labor market conditions and, possibly, more wage coordination in national level negotiations.

Figure 3: Rate of inflation, 1980-2004, percent

Source: Statistics Sweden

Labor productivity grew faster during the 1990s than during the 1970s and 1980s. Between 1992 and 2003 labor productivity grew at an average annual rate of 2.5 percent (see Figure 8 below). In part, this upturn of productivity growth reflects the “cleansing” effects of the recession, which forced the least productive plants to close, and recovery from the depths of recession. Yet the steady pace of productivity growth also indicates real improvements in economic performance and growth. Using (pre-crisis) 1991 as a base, real GDP per capita grew by 27.6 percent between 1991 and 2004, nearly identical to per-capita income growth in the U.S. over this period (27.7 percent).⁶ As we shall see, this growth was far more equally distributed in Sweden than in the U.S., where productivity gains accrued almost exclusively to high wage earners.

On top of these developments, Sweden's integration in world labor and product markets continues. Some would argue that this development “favors” a widening of wage differentials,

⁶ OECD Economic Survey, Sweden, 2005.

as technical progress has favored more skilled labor and globalization has increased the relative supply of goods produced by low-skilled foreign labor (see Forslid and Leamer, in this volume). These pressures are likely exacerbated by reduced barriers to international migration because a generous welfare state may be more attractive to the less-skilled, while talented Swedes may seek their fortunes abroad. We return to these points below.

2.2 Changes in population characteristics since the early 1990s

Wage dispersion and employment outcomes depend on the characteristics of the underlying population, for two reasons. First, by construction, wage dispersion will be greater when the skills of the working population are more heterogeneous. Second, changes in the shares of different skill categories affect relative wages for the usual factor-proportions reasons—absent the conditions for strict factor price equalization, a reduction in the share of less-skilled workers will raise their relative wage, and so on. On the first point, data from the International Adult Literacy Survey (IALS) indicate that countries with greater inequality of skills also have greater wage dispersion (e.g., Nickell and Layard, 1999, and Leuven et al., 2004). On the second, changes in within-country factor proportions affect within-country relative wages, contrary to what one would expect in a simple factor-price-equalization model of wage determination (Topel, 1997).

Compared to the U.S. the Swedish population was relatively homogenous in the beginning of the 1990s. An indication of this is that the variance of measured skills in the IALS was substantially lower in Sweden than in the U.S. But the heterogeneity of the Swedish population has arguably increased. The most obvious indication of this is that immigration surged dramatically, primarily during the first half of the 1990s. At a superficial level the importance of immigrants in the Swedish labor force does not appear much different than in the U.S. The share of immigrants in the Swedish population in 2003 – see Table 1 – is similar to what one finds for the U.S.; as of 2003, 13.5 percent of the working-age population was foreign-born. Moreover, the increase since the early 1990s – almost 3 percentage points – is

also comparable to the U.S. experience. But Sweden experienced an important and rapid shift in the source countries of new immigrants during the 1990s. In 1992, Nordic and non-OECD immigrants each accounted for 4.7 percent of the Swedish population. But by 2003 non-OECD immigrants accounted for 8.7 percent of the population, more than double the (declining) share of Nordic immigrants. Non-OECD immigrants now account for nearly two thirds of the immigrant population, but they were less than half a decade ago. As a share of immigrant *inflows*, these changes in the stock of immigrants imply a very large shift toward non-OECD immigrants. On average, the skills of these “new” immigrant groups are less apt to the Swedish labor market, which puts greater pressure on redistributive policies.

Table 1: Immigration

Year	Total	Immigrant share, population 18-64, percent		
		Nordic	OECD	Non-OECD
1992	10.8	4.7	1.5	4.7
1997	12.3	4.0	1.3	6.9
2003	13.5	3.4	1.4	8.7

Source: Calculations based on LINDA; see Edin and Fredriksson (2000)

Continuing previous trends, educational attainment in the Swedish population increased substantially during the 1990s; see Table 2. From 1992 to 2003, the share of the population with more than 12 years of schooling increased by 9 percentage points, as more educated younger cohorts replaced older, less educated cohorts. At the other end of the schooling distribution, there is thus a mirror decline in the share of the population with compulsory schooling (or less).

Table 2: Educational attainment

Year	Educational attainment, population 18-64, percent		
	Schooling \leq 9 years	Schooling 9-12 years	Schooling $>$ 12 years
1992	27.5	49.9	22.6
1997	23.9	49.6	26.5
2003	19.2	49.2	31.6

	Educational attainment, population 25-64, percent		
	Schooling \leq 9 years	Schooling 9-12 years	Schooling $>$ 12 years
1992	28.4	46.7	24.9
1997	23.5	48.2	28.3

2003	17.9	48.5	33.7
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Source: Calculations based on LINDA; see Edin and Fredriksson (2000)

These changes in the composition of the working-age population have implications for the effects of wage policies and labor market institutions. The decline in the share of less educated labor relaxes market pressures for low wages among the least skilled, so that redistributive wage policies may distort less, other things the same.⁷ In this context, the contraction of public sector employment in the mid-1990s, which increased the importance of private market outcomes, probably had less impact on inequality and employment than would have occurred in the 1970s or 1980s. Yet the rising share of refugee immigrants in the Swedish population, together with technical progress that has favored skilled labor, is an opposite force that challenges Sweden's egalitarian goals.

2.3 Institutional Changes

Given the substantial changes in the "environment", it would perhaps have been surprising if wage-setting institutions had not changed as well. In some important ways the institutional set-up is indeed different than during the preceding decades.⁸ As we will describe below, there was both more coordination *and* more decentralization in wage-setting. Yet collective bargaining agreements and unions appear to be as important in the Swedish labor market as they have been historically. Union density remained unchanged during the 1990s and the prominence of collective agreement remains in place in labor legislation.⁹

The crisis years of the early 1990s saw an interlude, however. After centralized bargaining was largely abandoned in the 1980s there was a temporary reversion of wage bargaining to a highly centralized level. A stabilization drive in 1990 resulted in a government-appointed commission delivering a proposal for wage-restraint during 1991-93. The proposal was finally

⁷ If changes in the skill composition of the labor force have not kept pace with technical and other changes in the skill composition of demand, then the distortions caused by of redistributive policies may have increased.

⁸ This section builds on Holmlund (2003).

⁹ Union density stood at 80 % in 1990 and 79 percent in 2000 (OECD, 2004).

accepted after negotiations with over 100 organizations. Wage inflation fell from over 10 percent per annum in the late 1980s to 4 percent in 1992 and to 2-3 percent in 1993-1994.

The years that followed involved a return to the largely decentralized wage bargaining at the industry level of the 1980s. But in 1997 a new regime emerged. The so-called “Industrial Agreement” (IA) was struck between unions and employers in the manufacturing sector. This agreement involves a set of procedural rules for labor negotiations, similar in many ways to the laws governing collective bargaining in the U.S. It stipulates, inter alia, time-tables for negotiations, rules for conflict resolution, and gives a prominent role for mediators to resolve disputes. The IA model has been followed by similar agreements in other sectors of the economy. By 2002, almost 60 % of the labor force was covered by IA-type agreements (Elvander, 2003).

While the IA-model may have delivered incentives for wage restraint at the aggregate level, it is reasonable to think that it has had a minor influence on the wage structure. The agreement seems to have resulted in fewer instances of industrial action in comparison with 1993-97. Nevertheless, it only establishes a set of procedural “rules of the game.” While there is a bargain struck at the central (national) level, in general, the negotiated wage increases only come into operation should there be disagreement at the local level.

The wage structure is probably more influenced by another institutional change in wage formation—a substantial move towards decentralization of wage negotiations. This started in the beginning of the 1990s when some central agreements for white-collar workers in the private sector contained neither total wage increases nor minimum wage increases. It was entirely up to the employer and the employee to determine the wage increase; see Lindgren (2005). The pace of decentralization has varied by sector and worker categories. Many central wage agreements specify a fall-back wage increase in case there is disagreement at the local level and a minimum guaranteed wage increases for each individual. In Table 3 we outline the wage agreement modes that existed in the Swedish labor market in 2004. As the

table illustrates, a wide variety of wage-setting practices exists in the Swedish labor market today.

In Table 3 we have ordered the models with respect to the influence given to the local bargaining parties. So model 1 has complete freedom for the local parties, while there is no local influence in model 7. Thus, rows 1-3 indicate that 36 percent (18+4+14) of employees are covered by agreements where local bargaining determines the local, employee-specific wage increase (in some cases subject to the restriction that individuals are guaranteed some minimal wage increase); another 47 percent are covered by agreements where the local parties determine the allocation of a given wage increase (the “wage frame”); an additional 10 percent has local bargaining having some influence of the distribution; finally, 7 percent have their wages set by the central agreement. Interestingly, all of the agreements where there is no local influence over the size and allocation of wage increases can be found in the private sector, which now accounts for about two-thirds of employment. In fact, in the public sector, previously rigid wage schedules were abandoned in the mid 1990s. In theory, wages are determined locally in the entire public sector and there is considerable leeway for employers to tailor wages so that they can recruit and retain employees.

Table 3: Wage agreement modes

Model	All	Percent of employees		
		Private	Central gov't	Local public
1. Local bargain without restrictions	18	7	38	28
2. Local bargain with a “fall-back”	4	8	0	0
3. Local bargain with a “fall-back” plus “guaranteed wage increase”	14	16	62	0
4. Local “wage frame” without “guaranteed wage increase”	30	12	0	72
5. Local “wage frame” with “guarantee” or a fall-back regulating the “guarantee”	17	28	0	0
6. General pay increase plus local wage frame	10	18	0	0
7. General pay increase	7	11	0	0

Notes: A “fall-back” means that the central agreement specifies a general wage increase that comes into operation should the local parties not agree. A “guaranteed wage increase” means each individual is guaranteed a wage increase of x SEK. A local “wage frame” means that the local parties are given a total wage increase but can decide on the distribution of that increase over individuals.

Source: National Mediation Office (2004)

Many central bargains are still binding when it comes to the lower tail of the wage distribution, however. Wage settlements for blue-collar workers involve centrally-determined minimum wages. And some 40 percent of employees are covered by agreements that guarantee each individual a certain pay increase. In general, wage determination for white-collar workers is subject to fewer restrictions than for blue-collar workers (National Mediation Office, 2004).

3. Changes in Wage and Employment Differentials

With the changes in the environment and institutions as a background, we now proceed to document the changes in the wage structure and employment which have occurred since the early 1990s, with particular emphasis on wage dispersion and employment differentials across skill groups.¹⁰

3.1 Changes in Wage Differentials

Figure 4 graphs summarizes some basic facts about the evolution of the wage distribution since the early 1990s, based on individual data recorded in the LINDA panel survey. The solid line shows the standard deviation of log wages; the dotted line graphs wage dispersion within industries while the dashed line corresponds to the residual log wage distribution after controlling for experience and education.¹¹

Figure 4: Overall and residual standard deviation of log wages

Source: Calculations based on LINDA.

¹⁰ There are of course other relevant papers on this; see, e.g., Gustavsson (2004), Le Grand et al. (2001), and Nordström et al. (2006).

¹¹ The numbers presented in this section come from the wage data contained in LINDA; see Edin and Fredriksson (2000) for a description of these data. In the pre-1998 data there is stratified sampling by firm size in the private sector. We correct for this by weighting using the inverse of the sampling weights at the industry level. We describe this procedure – and other data issues – in the appendix.

The basic fact is that wage inequality increased. The raw standard deviation of log wages increased from 0.25 in 1992 to 0.30 in 2003. This increase occurred both within industries (the dotted line) as well as within worker categories (the dashed line). The fact that residual wage inequality is uniformly lower than overall, but increased by the same amount, indicates that virtually all of the increase in wage inequality was due to changes in the returns to unmeasured characteristics of workers.

Figure 5 examines wage differentials between individuals at various percentiles of the wage distribution. The solid line shows a steady increase in the ratio of the wage at the 90th percentile of the overall wage distribution to the wage at the 10th percentile—the “90/10 ratio”. This ratio increased by some 15 log points between 1992 and 2001. Put differently, in 1992 the wage of an individual at the 90th percentile of the wage distribution was about 73 percent higher than that of a worker at the 10th percentile ($\exp(.55) = 1.73$). By 2003 the 90th percentile wage was over double the 10th percentile wage ($\exp(.70)=2.01$). The dashed and dotted lines decompose the 90/10 wage differential into 90/50 and 50/10 components, respectively. The increasing spread of the wage distribution was pervasive in the sense that both the 90/50 and 50/10 gaps widened. However, as in the U.S., most of the increase occurred in the upper half of the wage distribution—the 90/50 ratio rose by about 10 log points from 1992 to 2001, accounting for two-thirds of the change in the 90/10 ratio. The widening of wage differentials appears to have stopped in 2001.

Figure 5: Wage differentials at different points in the wage distribution, 1992-2003.

Source: Calculations based on LINDA.

Despite the trends in Figures 4 and 5, it is still the case that there is far less inequality of wages and incomes in Sweden than in the United States. In 2003, after roughly two decades of rising inequality in Sweden, the ratio of wages at the 90th and 10th percentiles stood at about 2.01. By comparison the 90/10 wage ratio in the U.S was about 5.5—over twice the

Swedish ratio. In other words, by any measure wage inequality in the U.S. dwarfs inequality in Sweden. This suggests that rising wage inequality in Sweden has some distance to go before it would be considered a meaningful threat to egalitarian ideals. Yet the rise in inequality in Sweden is important, at least by Nordic standards.

We noted earlier that the trend towards decentralized bargaining has been more pronounced among white-collar workers than among blue-collar workers. In Figure 6 we show that wage dispersion increased the most among white-collar workers. By 1992 the 90/50 differential among white-collar employees had regained its 1970 value, and it has remained above that level since. Compared to 1970, the only meaningful change in within-category relative wages occurred among low-wage white collar workers, for whom inequality declined sharply between 1970 and 1980. Among blue-collar workers inequality is uniformly lower, as skill heterogeneity itself is likely narrower for this group. Notice that increasing blue-collar wage differences since 1985—soon after the collapse of centralized bargaining in 1983—have brought within-group inequality “full circle” since 1970, continuing the trend noted by Hibbs (1990) and Edin and Topel (1997, Figure 4.2). The data in Figure 6 pertain to the private sector, but the analysis in Lundborg (2005) shows that these conclusions are also valid for the economy as a whole.

Figure 6: Wage dispersion by worker category in the private sector, 1970-2004

Source: Private sector wage data reported in Lindgren (2005)

Rising wage inequality in Sweden is a much-dampened reflection of what has occurred elsewhere since about 1980, especially in the United States and United Kingdom (e.g. Katz and Autor, 1999). Figure 7 shows the evolution of wage inequality in the U.S. since 1980; the 90/10 wage ratio increased by about 30 log points. In 1980 workers at the 90th percentile of the U.S. distribution earned roughly 4 times the wages of those at the 10th percentile. By 2000 that ration had risen to 5.5. By comparison, even after a nearly 20-year secular in wage

inequality, the corresponding ratio in Sweden stood at 2.01, or roughly half the 1980 level of inequality in the U.S.¹²

Figure 7: The log of the 90/10 ratio in the United States, 1980-2000.

Source: CPS

The U.S. workforce is far more heterogeneous than Sweden's, so direct comparison of inequality measures is problematic—few would claim that Sweden would have U.S. wage outcomes if it adopted American labor market institutions, or conversely. Other Nordic countries provide an alternative benchmark, albeit with similar wage setting institutions. Nordic countries share the feature of having very low wage inequality. In Finland, nothing seems to have happened to inequality during the 1990s. Using annual earnings of full time employees as a wage measure, the log of the 90/10 wage ratio in Finland was 0.91 in 1990; higher than in Sweden but well below most other developed countries. By 2003 this ratio was virtually unchanged (0.89).¹³ It is noteworthy that there have been no institutional changes in wage formation since 1990 in Finland; industry bargaining has prevailed throughout the time period.¹⁴ Norway provides another Nordic benchmark. In 1990, the log of the 90/10 ratio among full-time working employees stood at 0.88. By 2002 the ratio stood at 0.90. And as in Finland, there have been no changes in the institutional set-up of wage bargaining in Norway.¹⁵

Around 1990, the return to education was relatively low in Sweden—it averaged about 5 percent per additional year of education. This was low in comparison to other developed countries, and well below the estimated returns to schooling in the U.S., where average Mincerian returns to an additional year of schooling had reached about 14 percent by 1990—nearly three times the Swedish return. Over the ensuing decade, the U.S. return stayed

¹² According to OECD (2004), earnings dispersion around the turn of the century is low in Sweden compared with other OECD countries (it is comparable to countries such as Finland, Italy, and Norway). But the change in dispersion from the late 1980s to the early 2000s is greater than in the UK.

¹³ In 2003, the log of 90/10 earnings ratio (defined analogously) stood at 0.93 in Sweden.

¹⁴ Thanks to Roope Uusitalo for supplying this information.

¹⁵ We thank Kjell Salvanes for supplying this information.

roughly constant, while returns in Sweden rose slightly. This is illustrated in Table 4, which reports standardized wage differentials by observed characteristics at successive points in time. The estimates are obtained from wage regressions run separately for each year shown. Explanatory variables include schooling (sometimes splined), potential experience (dummies for each five year interval), gender, immigrant status (separate dummies for Nordic, OECD, and Non-OECD immigrants), and years since migration (dummies for each five year interval).

Though most of the increase in wage dispersion occurs within groups defined by observable characteristics, there is some action in the returns to those characteristics as well. The first row in the table shows that the return to education increased by 1.5 points (roughly 30 percent) over the 1990s. The returns to an additional year of schooling at the university level has been consistently higher than the return at lower levels, and it has increased more since the early 1990s. This, too, offers a contrast to the U.S., where returns *per year* are roughly equal across schooling levels. This may be further evidence that Swedish wage-setting institutions have relatively larger impact among the least skilled. As shown above, wages are more compressed among less skilled workers than among more skilled ones.

Table 4 also shows that there is a minor increase in the return to experience, as measured by the gap between new entrants and peak earners, and that the male-female wage gap has remained fairly constant. Wage differences among Nordic and OECD immigrants are remained small, reflecting (one presumes) their similarity to native Swedes. The story is different for non-OECD immigrants, for whom relative wages fell by about 4 percentage points over the decade.

Table 4: Log wage differentials by observed characteristics

	Year			
	1992	1996	2000	2003
<u>Additional year of schooling</u> (<i>s</i>)				
Average	0.049	0.052	0.061	0.064
$s \leq 12$	0.030	0.031	0.038	0.038
$s > 12$	0.066	0.068	0.077	0.079
<u>New entrants</u> (relative to peak wage earners)	-0.242	-0.286	-0.270	-0.276

<u>Women</u> (relative to men)	-0.165	-0.182	-0.181	-0.167
<u>Immigrants</u> by region of origin (relative to native-born)				
Nordic	-0.001	0.005	0.005	-0.002
OECD	-0.034	-0.023	-0.023	-0.019
Non-OECD	-0.050	-0.068	-0.085	-0.091

Note: Row headed "New entrants" pertains to those with 0-5 years of potential experience relative to those with 30-35 years of potential experience.

The upshot of the facts presented here is that skill premiums for observed measures of skill as well as residual wage inequality increased during the 1990s. But why? Given the institutional setting and evidence on driving forces in other countries, two explanations are plausible. The first is skill-biased technical change that has raised the relative productivity of those with greater skills. The second is decentralization of wage bargaining, which may facilitate the impact of technical change. We think the evidence favors a combination of these forces, but with greater weight on changes in the institutional features of wage formation. The reasons are twofold. First, nothing much has happened to wage dispersion in Norway and Finland; in these countries, there were no changes to the institutional set-up of wage bargaining and they were arguably exposed to the same forces of technical change as in Sweden. Second, we see the greatest increase in wage dispersion among white-collar workers in Sweden, and it is for this group of workers that the changes in the institutional features of wage formation have been most pronounced.¹⁶ Yet technology-driven changes in the value of skills may have played an important role in this. The evidence from the U.S. is that wage inequality and returns to education and experience grew rapidly during the 1980s, while these effects were greatly dampened in Sweden. The fact that inequality in Sweden increased during the 1990s can be interpreted as Swedish wage setting institutions delaying the tide of rising inequality caused by the increased value of skills.

3.2 Employment Differentials

¹⁶ Moreover, direct observation on segments of the labor markets where there were distinct changes in the wage-setting institutions are consistent with the conclusion that changes in the institutional set-up is a major factor driving the increase in wage inequality (see Söderström, 2006 and Granqvist and Regnér, 2006).

We now turn to the evolution of employment outcomes for different groups.¹⁷ Table 5 – which has the same structure as Table 4 – shows standardized differences in employment rates by observed characteristics.

Table 5: Employment differentials by observed characteristics, percentage point differences

	Year			
	1992	1996	2000	2003
<u>Education</u> (relative to those with upper secondary schooling)				
Compulsory schooling or less	-3.2	-8.0	-8.1	-9.5
More than upper secondary school	8.4	6.5	3.8	3.8
<u>New entrants</u> (relative to peak wage earners)	-38.1	-43.5	-36.3	-39.9
<u>Women</u> (relative to men)	-7.0	-5.3	-5.0	-4.3
<u>Immigrants</u> by region of origin (relative to native-born)				
Nordic	0.3	-2.2	-2.5	-2.3
OECD	-9.2	-9.4	-7.0	-9.2
Non-OECD	-9.6	-15.6	-13.4	-12.7

Note: Row headed “New entrants” pertains to those with 0-5 years of potential experience relative to those with 30-35 years of potential experience

The first two rows show employment differentials by education. For those with compulsory schooling or less, the contraction of the early 1990s caused a sharp and apparently permanent decline in relative employment opportunities. The fact that the university-educated also lost ground relative to upper secondary graduates is more surprising. But recall from section 2 that this period corresponded to a large increase in the relative supply of university-educated workers, which likely was a contributing factor.

The experience of non-OECD immigrants suggests a similar interpretation: their employment prospects have not fully recovered from the 1990s contraction, which is likely exacerbated by the large influx of refugee immigrants during the same time period. Perhaps

¹⁷ The definition of employment is obtained by combining wage and earnings data; the basic strategy is explained in the Appendix. The level of employment generated by this procedure is too low relative to the Labor Force Surveys; however the changes in employment correspond well to the Labor Force Surveys. The reason for not using the Labor Force Surveys at this stage is that we only observe foreign citizenship rather than immigrant status in these data. The possibility of standardization of the employment differentials is of course an additional virtue of using the micro data.

contrary to expectations, the contraction of the public sector did not cause a decline in the relative employment rate of women. Instead, a secular pattern of increased female employment (relative to men) continued through the decade.¹⁸

3.3 Wages and Employment by Skill Group

In this section we address the question of how wages and employment have evolved for different skill groups since the early 1990s. Our approach is similar to the approach of Juhn et al. (1991), who tracked the evolution of wage and employment inequality in the U.S. We develop a consistent set of wage-indexed “skill” categories by estimating a single wage equation for 2003, conditioning on observable characteristics. Given these skill “prices” for labor force participants, we predict wages for the entire population in each year from 1992 to 2003. We then rank individuals by skill (i.e. their predicted wage), and gauge the evolution of average wages and non-employment within deciles of the predicted wage distribution over the entire period. This procedure will most likely place non-employed individuals too high in the skills distribution—it over-predicts wages for non-workers since it ignores the role of unobserved skills—but we proceed with those caveats in mind.

Figure 8 shows real wage growth for workers in different intervals of the overall wage distribution, along with growth in economy-wide labor productivity (output per hour). Real productivity grew by roughly 28 percent between 1992 and 2003, or at a compound (and stable) rate of about 2.3 percent annually. This increase in productivity drove real wage increases of similar overall magnitude, but the figure also demonstrates that associated wage gains were not equally distributed across skill groups. Importantly, this pattern of growing real wages stands in sharp contrast to the period 1975-1995 when real wages did not grow at all; see Edin and Topel (1997). Wages for the most skilled individuals led the way, with average annual growth of 2.7 percent, while workers from the lowest decile experienced wage

¹⁸ This is the one instance where our analysis produces something substantively different than the Labor Force Surveys. This difference may have to do with our definition of employment or the fact that we are reporting standardized employment differences.

increases at the lower but still substantial rate of 1.7 percent per annum. Inequality increased—wage growth is perfectly rank ordered across intervals of the (predicted) wage distribution— but the data clearly indicate that rising productivity in the 1990s served to raise all boats.

Figure 8: Real wage growth by skill group (predicted wage percentile), 1992-2003, 1992=0

Source: Calculations based on LINDA.

The fact that real wages have grown for all skill groups in Sweden during the 1990s is in sharp contrast to the skill distribution of wage and productivity gains in the U.S., where many boats were not lifted in spite of similar increases in measured labor productivity and compensation per hour. Figure 9 shows the growth in average productivity per hour across all workers in the U.S. (top line) along with wage growth for the 95th, 50th, and 10th percentiles of the wage distribution from 1963-2000. Unlike in Sweden, during the 1990s only those at the top of the U.S. wage distribution experienced wage growth comparable to growth in aggregate real productivity. Individuals at or below the the median of the U.S. wage distribution experienced negligible real wage growth during the 1990s. Some of this difference between productivity and wage growth reflects growth in non-wage compensation in the U.S.—employer-provided health insurance is the most obvious example—but most of the gap appears due to growing inequality of productivities that favored wage earners at the highest reaches of the distribution.¹⁹

Figure 9: Growth in average productivity and real wage growth by percentile, 1963-2000

Sources: CPS and NIPA

Figure 10 shows the evolution of non-employment for the same skill categories used in Figure 8. It is evident that the least skilled (p1-p10) are more susceptible to economic

¹⁹ The wage measures for both the US and Sweden deflate wages by a common price index for all skill groups. In the US this overstates change in relative welfare, because prices have risen less rapidly for goods purchased by low income families. See Broda and Romalis (2008).

contraction than individuals around the median in the skill distribution (p31-p70).

Nevertheless, the employment prospects for all other groups than the least-skilled have improved since 1992. The decline in the employment prospects for the least skilled since 1992 relative to the change for the median is significant at conventional levels (the difference in the changes has a t-ratio of -9.6). Thus, the evolution of employment rates for the least-skilled compounds the pattern of rising inequality shown in Figure 8. In section 5 we pay closer attention to the employment prospects of the less skilled and how they are influenced by wage policy.

Figure 10: Non-employment by skill group, 1992-2003, 1992=0

Source: Calculations based on LINDA.

4. Wage Policy, Skill formation, and Skill Allocation

Swedish wage policy, implemented by collective bargaining, has clearly produced a different allocation of labor across industries and workers across skills than would an unimpeded labor market. The incentives to invest in skills and to seek productive employment opportunities may be curbed by wage compression. Moreover, an explicit aim of Swedish wage policy has been to price some jobs out of the market. Thus wage policy affects both ends of the (potential) skill distribution. The purpose of the next two sections is to look more closely at these two aspects of wage policy. We begin by looking at how incentives to invest can affect human capital formation. We follow by examining the effects at the lower end of the skill distribution.²⁰

Having the right incentives is obviously important in a number of ways. They are essential for the acquisition of the (right) skills; they influence labor supply and are conducive for

²⁰ Throughout we focus on wage policy and how it may influence wage returns and employment outcomes. Obviously, other institutional arrangements are also important if we want to understand the full difference between the employment rates of, e.g., natives and immigrants. Note also that our basic approach is the “narrative” – establishing causality is a much more difficult issue.

using the acquired skills in the most valuable way. Further, international migration is also affected by the return to skills. Measuring these various dimensions of the relationship between incentives and skills is of course difficult. But some aspects – such as the association between the returns to education and enrollment – are measurable.

In Figures 11 and 12, we examine the relationship between the returns to university education and the university enrollment rate in Sweden and the U.S. respectively. These graphs are constructed in a slightly different fashion – for Sweden we report the fraction of the population aged 19-21 attending universities while for the U.S. we show the fraction of high-school graduates attending college – but the spirit of the calculations is the same.

Figure 11: Returns to university and the university enrollment rate (share of population) in Sweden, 1968-2003.

Sources: Education and population statistics from Statistics Sweden (enrollment rate) and estimates based on LINDA (wage return)

Figure 12: Returns to college and the college enrollment rate (share of high-school graduates) in the US, 1963-2001.

Source: Current Population Survey

Both figures convey the message that investments in this form of human capital respond to changes in the returns on such investments. Figure 11 shows two swings in the Swedish data. The returns to university education declined by roughly half—from 10.6 to 5.2 percent per year—between the early 1970s and the mid 1980s, concomitant with the decline in overall wage inequality in Sweden. Then the return rebounded; by 2003 it had risen to about 8 percent. Importantly, the university enrollment rate mirrors this development, declining as the financial rewards to schooling fell, and increasing as those returns subsequently rose.

This connection between rates of return and investment in human capital is also evident in the U.S. Figure 12 shows corresponding patterns for investment and returns in the U.S. from 1963 and onwards. Here the measurement of schooling investment is the fraction of high school graduates from a given cohort who report at least one year of college education. Figure

12 is slightly more compelling than Figure 11, as in the U.S. there is greater variation in the rate of return over time. The U.S. return per year of college bottomed out at about 7 percent in 1979, having declined by 5 percentage points since 1968. This corresponds closely with the trough in the fraction of eligible high school graduates with college training, which declined to 41 percent for the 1978-79 cohorts of high school graduates. Then the returns doubled to about 14 percent in the 1990s—far above anything observed in Sweden—which lines up with a 13 percentage point increase (from 41 to 54 percent) in the fraction of high school graduates who have completed some college. The implied elasticity of U.S. human capital investment with respect to the Mincerian return is about 0.40.

The evidence in Figures 11 and 12 has important implications for Swedish productivity and economic growth. Egalitarian policies—which range from wage bargaining institutions to redistributive taxes and publicly provided consumption—clearly compress wage, income and consumption differences across skill groups. These differences *are* the returns to investing in productive skills, so the evidence is that wage compression impedes human capital formation. If we take the U.S. schooling data seriously, the elasticity of human capital with respect to wage returns is substantial. We have no evidence on how these policies affect investments in other forms of human capital, such as occupational choice, job-specific training and the accumulation of other post-schooling skills, but neither do we have reason to believe these investments would respond differently than does schooling.

How large might be the effects on long run productivity and welfare be of slight increase in wage inequality? Consistent with U.S. data, assume the elasticity of human capital investment with respect to its return is 0.4. In Sweden today, the log of the 90/10 wage differential is about .70 (see Figure 5) which, as we have noted, implies that a 90th percentile Swede earns about double the wage of a Swede at the 10th percentile of the wage distribution. Reasonably, Swedish wage setting and other institutions have compressed these returns to skill. Suppose that restrictions on wage setting were relaxed in such a way that the log 90/10 differential increased from .7 to .8, for an earnings ratio of 2.23. Few would argue that such a change has

a major impact on egalitarian outcomes. This change implies a 14.3 percent ($.10/.70=.143$) relative change in inequality.

Now suppose that the returns to skill rise in the same proportion. With a long run elasticity of investment in human capital of 0.40, this yields a long run change in the aggregate human capital stock of 5.7 percent ($.143 \times 0.40 = .057$). In modern theories of economic growth, long run productivity is proportional to human capital, so this change yields a permanent increase in national income of 5.7 percent. We are not expecting anyone to take the exact number very seriously. Still, this calculation indicates that there may be large gains from relaxing institutional restrictions on wage-setting (in other words, the efficiency costs of egalitarian policies may be quite large).

Another dimension of economy-wide human capital formation concerns the skill content of international migration. While it is true that international migration flows are pretty low at present, even small flows may be a problem if the most talented leave the country. Moreover, international migration may be an increasingly important phenomenon as world market integration progresses.

Basic human capital theory suggests that high-ability immigrants should be attracted to countries having more wage dispersion and greater returns to skills. This prediction is largely confirmed by comparing the immigration experiences of the US and the EU as a whole; see Wasmer et al. (2007). Figures 13 and 14 examine this issue in the context of Swedish/U.S. immigration flows. The figures show immigrant shares by percentiles of the wage distribution in the two countries. Immigrants to Sweden – see Figure 13 – are concentrated in the lower part of the wage distribution. Splitting the data by broad regions of origin we see that this low-skill concentration is entirely due to non-OECD (refugee) immigrants being more prevalent at the lower end of the wage distribution; immigrants from Nordic and OECD countries are broadly distributed in the same way as native Swedes.

Figure 13: Immigrants by wage percentile in Sweden, 2003.

Source: Calculations based on LINDA.

Figure 14: Immigrants by wage percentile in the US, 1999.

Source: Calculations based on the CPS

Figure 14 shows an analogous plot for the U.S. In contrast to the low-skill concentration of Swedish immigrants, in the U.S. immigrants are more prevalent at both extremes of the wage distribution. Splitting the data by ethnic origin (not shown) demonstrates that Asians are about as likely to be at the top as at the bottom of the wage distribution in the U.S., while Hispanics look more like non-OECD immigrants to Sweden.

Given the nature of the recent immigrant inflow to Sweden, it is potentially misleading to compare Sweden and the U.S. without adjusting for the fact that the source countries are different, as are the reasons for immigration. The possible connection between skill-content of immigration and the returns to skill is likely to be substantially weaker among refugee immigrants. To obtain a sharper comparison, we focus on immigrants from OECD-Europe (excluding the Nordic countries).²¹ Notice that the distribution over source countries within this immigrant group is very similar in the U.S. and Sweden, so such differences will not be influencing our comparisons.

Figure 15: The share of immigrants from OECD-Europe by wage percentile in the Swedish and US wage distributions

Sources: Calculations based on LINDA (Sweden, 2003) and Census PUMS (U.S., 1999).

²¹ The reason for excluding the Nordic countries is that gravity is likely to be an issue here. Presumably, it is a much bigger step to move to the U.S. than to Sweden for Nordic immigrants. For analogous (but converse) reasons, we do not want to include immigrants from Central and South America in the comparison, who have much stronger ties to the U.S..

In Figure 15 we compare the distribution of OECD-European immigrants in the Swedish and U.S. wage distributions respectively. While immigrants to Sweden from OECD-Europe are distributed roughly in the same way as native Swedes, the salient fact in the U.S. is that OECD immigrants are disproportionately high-skilled, as indicated by market wages. Figure 16 further develops this point, comparing the ranking of immigrants from the Nordic countries with the ranking of immigrants from OECD-Europe within the U.S. wage distribution. To smooth the data somewhat, we now show the cumulative fraction of immigrants at each percentile of the U.S. wage distribution—a sort of relative Lorenz Curve.²² Our finding is that Nordic immigrants to the U.S. are *more* heavily concentrated at the high end of the U.S. wage distribution than are other European immigrants. Most of this difference is above the 90th percentile—that is, Nordic immigrants to the U.S. are disproportionately concentrated in the upper decile of the U.S. wage distribution, where the returns to skill are much higher than in their home countries.

Figure 16: Cumulative wage distributions of Nordic and other OECD Europe immigrants by percentile of U.S. wage distribution.

Source: Census PUMS, 1999.

The question then is how we should interpret Figures 15 and 16. One interpretation is that there is self-selection in the immigrant pool, and talented Europeans are attracted to the U.S. because of higher returns to skill; see Figure 15. On this interpretation, the greater concentration of Scandinavian immigrants at the top of the U.S. wage distribution is due to greater returns to migration among the most talented, as wage distributions in their home countries are particularly compressed, even by European standards; see Figure 16. There is a European “brain drain” to the U.S., and the effects are most pronounced in Nordic countries where wage compression is most severe.

²² There were not enough observations on Swedish immigrants (80) to do a reliable comparison, so Nordic countries include Norway, Finland, Sweden, and Denmark, yielding 204 immigrants. Non-Nordic countries are Austria, Belgium, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Switzerland, and the UK.

Against this one might argue that the average native-born Swede is more skilled than the average native-born American, so a given immigrant will have a lower rank in the Swedish than in the U.S. wage distribution. That there is some truth to this story is suggested by the IALS data; see OECD and Statistics Canada (1995). Among the countries listed in the Table, Sweden has the highest mean score, while the mean score in the U.S. is slightly below the other Nordic countries. The table also shows that an immigrant for any given OECD country would rank lower in the Swedish skill distribution than in the U.S. one.

Table 6: Test scores according to the International Adult Literacy Survey

Country	Mean	Rank in Swedish distribution	Rank in U.S. distribution
Belgium	279	30 th	48 th
Denmark	289	37 th	56 th
Finland	289	37 th	56 th
Germany	287	36 th	55 th
Ireland	262	20 th	37 th
Italy	244	13 th	26 th
Netherlands	288	36 th	55 th
Norway	296	43 rd	62 nd
Sweden	308	--	69 th
Switzerland	285	34 th	53 rd
United Kingdom	270	24 th	42 nd
United States	284	33 rd	--

Notes: The sample pertains to natives aged 16-65 in the respective countries. Sampling weights are used.

So let us narrow the comparison even more to try to separate the two explanations. In Figure 17, we compare Nordic immigrants in the U.S. with German immigrants. We select Germany as the comparison since they are most similar to Nordic immigrants – mean skills as measured by the IALS are only slightly below the averages in Finland and Denmark.

Figure 17: Cumulative wage distributions of Nordic and German immigrants by percentile of U.S. wage distribution.

Source: Census PUMS, 1999.

The conclusion is very similar to the one obtained from Figure 16. Nordic immigrants in the U.S. are much more concentrated at the top of the U.S. wage distribution than are German immigrants. The evidence suggests that wage compression provides the strongest incentives

to migrate to the most talented Swedes—a version of the brain drain—and that Sweden is relatively more attractive to less skilled migrants. These effects on the composition of migrants are probably not alarming at present, but may be a more pressing concern in the near future.

Another margin where wage policies may affect skill allocation concerns the utilization of human capital. The total amount of time in market work is substantially lower in Sweden (and any other European country) than in the U.S. In 2004, the average employee worked 1,585 hours per year in Sweden; the corresponding American worked 1,825 hours.²³ But if one compares the “total” amount of work – i.e. the sum of market work and time spend doing household work – there is no difference across the two countries (Olovsson, 2004). Different incentives thus imply that Swedes allocate less time to market activities—further evidence that welfare state policies distort incentives relative to unimpeded market outcomes. Of course, also in this instance other features of the welfare state are relevant, as the total “wedge” between market and household activities is influenced by income taxes and transfers as well.

5. Wage policy and Its Effects on Less Skilled Workers

The fact that the total amount of work – particularly for females – is similar in Europe and the U.S. is consistent with the “marketization” hypothesis of Freeman and Schettkat (2005). The essence of their argument is that most European countries have wage setting frameworks that include both a greater role for collective bargaining and higher payroll taxes than in the U.S. This combination has raised the price of services intensive in low-skilled labor, and so Europeans have lower market consumption of these services than Americans. Freeman and Schettkat go on to argue that increased marketization of services would free-up more time for women to engage fully in market activities and make full use of their human capital

²³ The numbers come from OECD Labour Statistics 2004.

investments. But this would require some relaxation of wage restraints among the least skilled.

Female employment rates in Sweden are closer to those in the U.S. than continental Europe. An important reason for this is that services such as child-care (see Kolm and Lazear's contribution to this volume) and elderly care are publicly provided in Sweden rather than being produced by the market and the household, as in the U.S., or predominantly the household, as in Germany. Nevertheless, some services such as cooking and cleaning are still home-produced to a greater extent in Sweden than in U.S. These facts imply that the private service sector will be smaller in Sweden than in the U.S.—and it is, see Table 7. Of course, the distribution of employment over industries is different in Sweden than in the U.S. for a variety of reasons. The first question we take up (section 5.1) is whether relative industry size is related to the employment prospects of workers with different skills. For instance, one may suspect that the employment opportunities of immigrants—who are disproportionately employed in low-wage services in all industrialized countries—are worse in a country where services are produced in the market to a lesser extent.

The distribution of industry employment in a given country depends on the entire institutional set-up in that country. In addition to wage policy, tax and industrial policies have effects on the services and goods produced in the market (see Davis and Henrekson's contribution to this volume). In section 5.2, therefore, we look directly at wage policies affecting the lower end of the skill distribution, with a focus on the impact of negotiated minimum wages on employment.

5.1 Industry Size and Employment of the Least Skilled

In 2000, the employment-to-population ratio of native Swedes was 17.6 percentage points higher than for immigrants. In the U.S., the employment-to-population ratio of immigrants is slightly *higher* than for natives. A possible explanation for this gap is that the Swedish labor

market offers scant employment opportunities for immigrants, especially less-skilled recent immigrants. Table 7 sheds light on this question by using the U.S. distribution of employment across broad industry categories as the “counterfactual”. In other words we ask: If industry employment shares in Sweden were like those in the U.S., what would happen to the demand for immigrant labor in Sweden? Would employment opportunities improve? We impute the immigrant distribution over industries using the U.S. distribution of industry employment, taking as given the concentration of immigrants in Swedish industries.

The first two columns report the distribution of employment in the overall population for the U.S. and Sweden respectively. Manufacturing’s share is smaller in the U.S. than in Sweden while private services, in general, employ a greater fraction of individuals in the U.S. The third column reports the distribution of employed immigrants in Sweden. Compared to Swedish natives and to the U.S. labor force, Swedish immigrants are disproportionately employed in manufacturing. Somewhat surprisingly, perhaps, they are about as prevalent in trade, hotels and restaurants as the overall population. However, this is simply due to the aggregation of Retail and wholesale trade and Hotels and restaurants. A finer division of the data by industry also reveals that they are much more prevalent in hotels and restaurants, but less prevalent in retail and wholesale trade.

Table 7: Employment by industry in Sweden and the US in 2000

Industry	US	Sweden				
		Percent of total employment per group				
	All	All	Immigrants		Lowest quartile	
			Actual	Imputed using US	Actual	Imputed using US
	(1)	(2)	(3)	(4)	(5)	(6)
Agriculture, forestry and fishing	2.4	2.7	1.3	1.2	2.3	2.0
Mining and quarrying	0.4	0.2	0.0	0.1	0.1	0.1
Manufacturing	12.6	17.5	22.7	16.3	16.7	12.0
Power and water plants	0.6	0.7	0.2	0.2	0.3	0.3
Construction	5.7	5.2	2.7	2.9	2.1	2.3
Retail and wholesale trade; Hotels and restaurants	24.7	15.5	15.6	24.9	25.1	40.0
Transport and communication	5.1	7	7.0	5.1	5.3	3.9
FIRE	16.8	13.4	13.1	16.4	11.9	14.9
Community and personal services	31.8	37.8	37.3	31.4	36.2	30.5
Total	100.1	100.0	100.0	98.5	100.0	106.0

Source: Calculations based on STAN and LINDA. The numbers in col. (4) are calculated as $\text{col.}(4) = (\text{col.}(3)/\text{col.}(2)) * \text{col.}(1)$. The numbers in col. (6) are calculated in analogous fashion. Columns headed “Lowest quartile” pertain to individuals who are in the lowest quartile of the predicted wage distribution. This wage prediction was generated in the same fashion as in section 3.3.

For the broad categories used in this calculation, the two industries that account for the largest shares of Swedish immigrant jobs (manufacturing and community and personal services) are smaller in the U.S. than in Sweden. So a shift to the U.S. distribution of industry employment would reduce the immigrant employment rate, holding constant the relative distribution of immigrants across industries. Immigrant employment would be reduced by 1.5 percent in this conceptual experiment—see column (4)—increasing the immigrant/native gap in the employment to population ratio to 18.3 percentage points. Having said this we should note that this result is partly an artifact of the 1-digit industry classifications used in Table 7, which may mask the expansion of employment opportunities for immigrants.

The last two columns of the table report the results of an analogous exercise for individuals predicted to have a low wage. Column (5) thus reports the actual distribution of employment over industries for individuals that are predicted to be in the lowest quartile of the wage distribution. A comparison of columns (5) and (2) reveals that the major difference between these individuals and the overall population is that they are more likely to be employed in retail and wholesale trade and in hotels and restaurants relative to the overall population. The U.S. distribution of industry employment thus implies an increase in the employment rate for low wage individuals. The U.S. “counterfactual” suggests that the employment to population ratio would increase by 6 percent, which would contribute to a decrease of the employment gap by almost 3 percentage points – from 22.9 to 20.1 percentage points, though we put more stock in the direction of this effect than in the particular magnitude estimated in this illustrative exercise.

5.2 Minimum Wages and Employment

As we noted earlier, minimum wages in Sweden are determined by the collective bargaining process rather than by legislation; there is no legal minimum wage, though negotiated minima have the force of law because even non-union employees can opt for the union scale. So minimum wages will generally vary by industry, as well as by age, occupation, and experience. And, by most standards, they are high.

How high? Very. Table 8 shows the minimum wage bite by country in 2004, defined as the minimum wage divided by the median wage in manufacturing in each country.²⁴ Apart from Sweden, all countries reported in Table 8 have legislated minimum wages. For Sweden, we report a range since the minimum wage varies across collective bargaining agreements. Among the countries covered in Table 8, Sweden has the highest minimum wage bite. This reflects what seems to be an empirical regularity—minimum wages tend to be higher when they are subject to bargaining rather than legislation. In 2001, minimum wages in Norway and Denmark were higher than in Sweden, while Finland's was slightly lower and Germany's was much lower; Andersson et al. (2002).²⁵ Thus, the Nordic countries share the feature of having high minimum wages, just as they share many other features concerning wage dispersion and institutions.

Table 8: Minimum wage bite by country in 2004, percent

Country	Minimum wage bite
Australia	59
Belgium	49
Canada	40
France	57
Greece	48
Ireland	52
Japan	34
Netherlands	46
New Zealand	54
Portugal	38
Spain	30
Sweden	60-72

²⁴ Much of the information on minimum wages in this section comes from Per Skedinger. We have also obtained some information on minimum wages from Albin Kainelainen. We thank them for supplying the data.

²⁵ For countries with bargained minimum wages, Andersson et al. (2002) look at the minimum wage for dish washers and relate that to the mean manufacturing wage. In 2001, the minimum wage bite, defined in this way, was close to 70 percent in Norway, slightly above 60 percent in Denmark, 60 percent in Sweden, roughly 55 percent in Finland, and 40 percent in Germany.

United Kingdom	43
United States	32

Notes: The minimum wage bite is defined as the minimum wage relative to the median manufacturing wage in each country. For the US we report the federal minimum wage; the number for Canada refers to a weighted average across regions.

Source: Low Pay Commission (2005)

Figure 18 tracks the evolution of Sweden’s minimum wage “bite” since 1991, defined here as the minimum relative to the mean wage in each industry, for a collection of industries. It is evident that the bite of the minimum wage is higher in the service sectors than in manufacturing, reflecting lower average wages in services. From 1994 to 2004 the minimum wage bite declined by roughly 8 percentage points (to 63 percent) in manufacturing. In private services, on the other hand, the wage bite has been roughly constant (Retail trade) or increased (Hotels and Restaurants). It is clear that minimum wages have significant bite in Hotels and Restaurants—the bargained minimum stood at 85 percent of the average wage by 2003—so for practical purposes the minimum contractual wage compresses the wage distribution in this sector substantially from below.

Figure 18: Minimum wage bite for a selection of industries.

Source: Skedinger (2006a). Minimum wages come from the various wage settlements. Average wages pertain to unskilled workers and come from Statistics Sweden and the Swedish Municipal Workers’ Union.

Of course, minimum wages have differential bite for various worker categories. Table 10 illustrates this by showing the minimum wage as a percentage of the mean wage for the native-born, for the native-born aged 20-25, and immigrants. Here we focus on a single wage agreement – that pertaining to blue-collar workers in the local public sector. Minimum wages have substantial bite in these blue-collar occupations. The minimum wage bite varies in a rather obvious way across worker categories: immigrants and youths have lower wages than the average native-born and, hence, the minimum wage amounts to a greater fraction of the mean wages of these two groups.

Table 10: Minimum wage bite by worker category, local public sector in 2003

Worker category	Wage bite, percent
Natives, unskilled	79
Natives, semi-skilled	72
Immigrants, unskilled	83
Immigrants, semi-skilled	74
Age 20-25, unskilled	83
Age 20-25, semi-skilled	79

Notes: Unskilled occupations have no educational requirements. Semi-skilled occupations normally require a vocational upper-secondary degree.

Source: Calculation based on LINDA.

The interesting question is whether minimum wages reduce the employment prospects of the less skilled. This is a controversial issue in the empirical literature on minimum wages,²⁶ yet evidence from Sweden indicates a substantial effect. Edin and Holmlund (1994) used time-series data to examine whether youth employment in manufacturing is related to the minimum wage bite. They found that the minimum wage is negatively related to youth employment. Skedinger (2006b) studied the consequences of minimum wages in Hotels and Restaurants, using individual wage and employment data. This allowed Skedinger to isolate which workers are most likely to be affected by minimum wage changes. He then relates the wage and employment experiences of this group to the experiences of a comparison group consisting of individuals with similar wages initially but who are less affected by minimum wage changes.²⁷ Like Edin and Holmlund, Skedinger also finds negative employment effects of increases in the minimum wage, and the effect is substantial. His baseline estimates indicate that a 10 percent increase in the minimum wage reduced the relative employment rates of affected workers by the minimum wage change by 5 percent—a demand elasticity of about -0.5 among low-skill workers.

We noted above that the employment/population ratio among immigrants is 17.6 points lower among Swedish immigrants than among natives, but that in the U.S. these ratios are roughly comparable. Given a demand elasticity of -0.5 it is reasonable to conclude that some

²⁶ In some notable examples, increases in minimum wages even have positive employment effects; see Card and Krueger (1995).

²⁷ Of course, there is considerable difficulty in finding a comparison group who was not treated by the minimum wage. Most realistic theories predict that minimum wage changes will affect the entire wage distribution.

of this immigrant/native employment gap in Sweden would close if bargained minimum wages in Sweden were to decline. It is highly unlikely, however, that the immigrant/native employment gap would disappear completely as in the U.S. case, since the characteristics of the Swedish and U.S. immigrant populations are very different.

6. Conclusions

The original SNS-NBER study of the Swedish labor market was written in the midst of the economic crisis of the early 1990s. In this sequel we have focused on the post-crisis performance of the labor market, emphasizing institutional and other changes that have affected wage determination, inequality and employment. Our major conclusions are the following:

1. Changes in Wage Determination

The institutional features of wage determination have changed since the beginning of the 1990s. The advent of the “Industrial Agreement”—and similar agreements in other sectors—appears to have reduced aggregate wage pressure. However, the impact of these agreements on the wage structure is likely to be limited. Wage differentials are more influenced by the decline of centralized bargaining and the consequent decentralization of negotiated wages. The tide towards decentralization is most evident among white-collar workers. Changes in the wage determination process for blue-collar workers are more minor. Bargained minimum wages are as prevalent as earlier and the growth of minimum wages is largely on par with the growth of average wages. As a result, wage compression at the bottom of the skill distribution remains important.

2. Changes in Wage Differentials

Consistent with trends in other industrialized countries, wage dispersion in Sweden has increased since the early 1990s. This increase was concentrated among white-collar workers and in the upper tail of the wage distribution. The return to education and the wage-gap

between refugee immigrants and natives rose as well, indicating that Sweden's modest move toward greater inequality reflects rising returns to human capital. Decentralization of wage determination has probably contributed to greater wage disparities, but decentralization may also be an effect rather than a cause of rising inequality. As argued by Edin and Topel (1997), rising returns to skill increased the distortions of centralized bargaining, and likely prompted its demise. Decentralized wage setting added a layer of flexibility that better reflects market realities.

3. Wage Policy and Efficiency

In an unregulated market the wage has an important allocative role. For instance, regional wage differences contribute to mobility and skill differences in wages are the financial returns for acquiring human capital. Consistent with the latter effect, we have shown that university enrollment is positively associated with the return to education in both Sweden and the United States, indicating that a cost of Sweden's egalitarian policies may be to dampen investment in human capital. Similarly, we find that migrants *from* Sweden are likely to be highly skilled, while recent immigrants are heavily concentrated at the lower end of the Swedish skill distribution. All of this suggests dampened growth of human capital, which may have long term effects on living standards.

4. Wage Policy and Distribution

Productivity growth has been high in Sweden since the beginning of the 1990s. Some of this reflects a recovery from crisis, but the evidence also suggests an improvement in long-term economic growth. Unlike the U.S. experience, where productivity growth appears to have been mainly concentrated among the most skilled, Sweden's productivity gains in the 1990s were more equally (though not equally) distributed across wage and income categories. It seems highly likely that this difference across the two countries is at least partly due to the difference in wage-setting institutions and other redistributive policies. But it also seems implausible that the gains that have accrued mainly to the most highly paid in the U.S. would

have gone to others if American wage setting institutions were different—it is also a matter of whose productivity has risen.

5. Wage Policy and Employment

Since the early 1990s, employment growth has been lower than average for those with the weakest position in the labor market. It is difficult to tell to what extent this is due to wage policy. But wage policy has contributed to a different industrial structure in Sweden than in the United States. If Sweden's industrial structure would become more similar to the U.S., employment prospects for the least skilled would improve. Minimum wages are likely to have especially hampered the employment prospects of immigrants and youths. These pressures are unlikely to abate given the character of Sweden's recent immigration experience and the possibility of rising immigrant flows in the future. In this light, the employment distortions of minimum wages are likely to be greater today than earlier, and possibly greater in the future than at present.

What can we take from this evidence? Ten years ago in the midst of economic crisis it was plausible to argue that a bit more inequality in wage outcomes would be a small price to pay for long-term improvements in economic performance. Whether causally or coincidentally, inequality in Sweden has risen and economic performance has improved. But by almost any standard, inequality in Sweden remains remarkably low. Is the same prescription warranted today as ten years ago? This is in some part a matter of values. Nevertheless, it seems to us that the market realities are pushing towards increasing wage differentials. In this environment, a given set of egalitarian outcomes will cause greater efficiency losses today than ten years ago.

What kinds of policy levers are available if one believes, for example, that minimum wages distort more today than 10 or 20 years ago? Wage “policy” is in part a misnomer: It is not directly a tool of government economic policies. It reflects Sweden's collective bargaining institutions, and these are unlikely to change rapidly, if at all. But relevant wage

differences are, for the most part, after-tax and after-transfers, which leaves some leverage for policy adjustments that could improve labor market performance and increase prosperity in Sweden.

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Data appendix

The purpose of this appendix is to describe our data construction efforts in more detail. Our data come from LINDA (see Edin and Fredriksson, 2000). Throughout we sample employees aged 20-64 whose educational attainment is not missing.

Weighting

The collection of the wage data has varied over time. Prior to 1998, the data have been collected by stratified sampling of the employed in the private sector. From 1998 and onwards the wage data are representative for the employed population.

When data were collected by stratified sampling, small firms were sampled with low probability (0.02 for firms with less than 10 employees) and the sampling probability increased with firm size (it is unity for firms with more than 500 employees.) Unfortunately, there is no information on the individual sampling probability in the data. However, we know the firm size distribution in each industry. Using these data together with the sampling probabilities, we calculate the average sampling probability for each two-digit industry. Pre-1998 private sector data are thus weighted by the inverse of the sampling probability by industry to obtain estimates that are representative of the population. As a check on whether this procedure delivered sensible results we used data from 2003. In the 2003 data, we know who would have been sampled under stratified sampling. Assuming that the difference in sampling procedure has a proportional effect on the measured standard deviation (for all years) we can calculate the adjustment necessary to go from the representative population to the population obtained by stratified sampling. Figure A1 shows the standard deviation of the log wage distribution for different ways of adjusting the pre-1998 data. The line labeled “adjusted” reports the standard deviation obtained using this adjustment and the line labeled “weighted” report the estimated standard deviation using our weighting strategy. As shown by the figure these two estimates more or less go together.

Trimming

In the wage data, there were some (albeit very few) obvious measurement errors in the lower tail of the wage distribution. Therefore, we trimmed the lower tail of the wage distribution by deleting those earning less than 17.45 SEK per hour (roughly 2.2 dollars an hour at the 2005 SEK/dollar conversion rate). This had the effect of deleting 121 individuals in 1999 and less than 5 for all other years.

Years of schooling

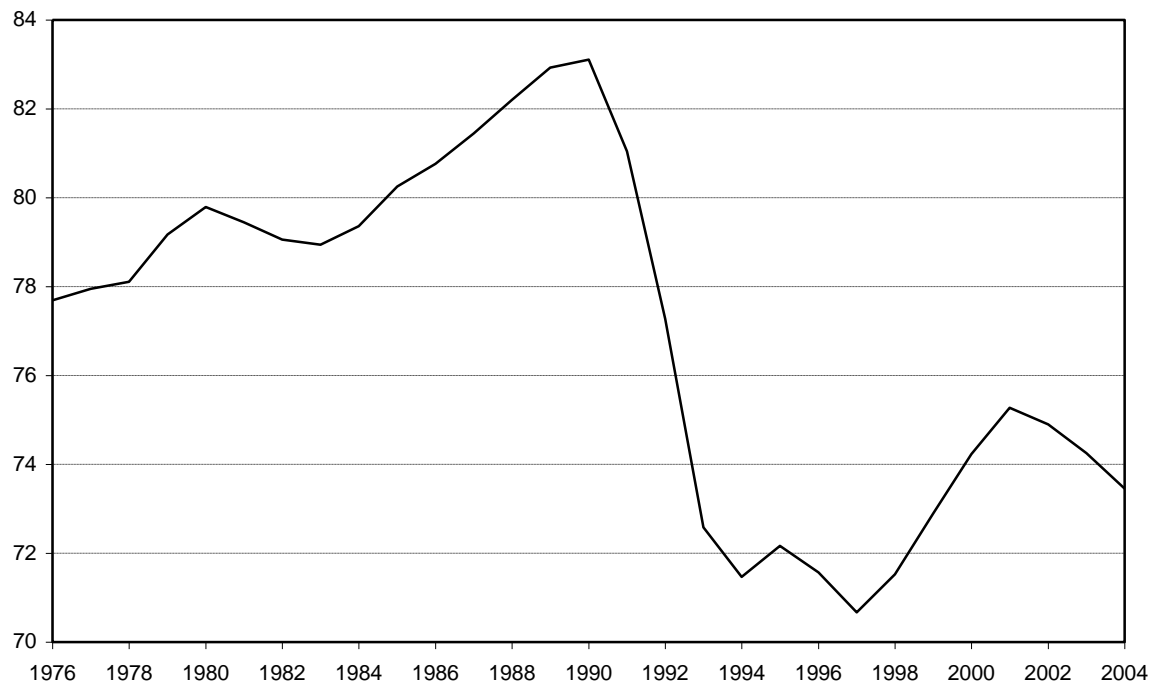
We have imputed years of schooling from attainment data. The attainment data come from registers which records the degrees of the individuals. This education register has gradually become more informative over time; in later years it includes adult education and courses taken at the university level. The latest versions of the education register include measures of the normal time to degree for all attainment levels. For all years there is also information on when the degree was obtained. We opt for an algorithm where we assign the most informative measures of education also for the earlier years when it is obvious that the individual has not upgraded his/her education between these two time points.

Employment

We define employment on the basis of earnings data. Rather than opting for a single earnings limit applied to all individuals for each year, we calculate separate earnings limits for 32 cells based on gender, schooling, region of origin and experience. The reason for having several thresholds is that we wanted to avoid having all high-wage individuals automatically being classified as employed. The exact procedure was the following: For each year, we divided the wage data into 32 cells based on gender, schooling, region of origin and experience. Then we identified the wages of the individuals on the 1st percentile and the 10th percentile for each cell and calculated average earnings for individuals within the interval defined by the 1st to 10th percentile. All individuals with earnings above this threshold in each cell are defined as employed. The level of employment generated by this procedure differs somewhat from the one reported in Labor Force Survey. But the evolution of employment over time corresponds reasonably well to the Labor Force Surveys; see Figure A2.

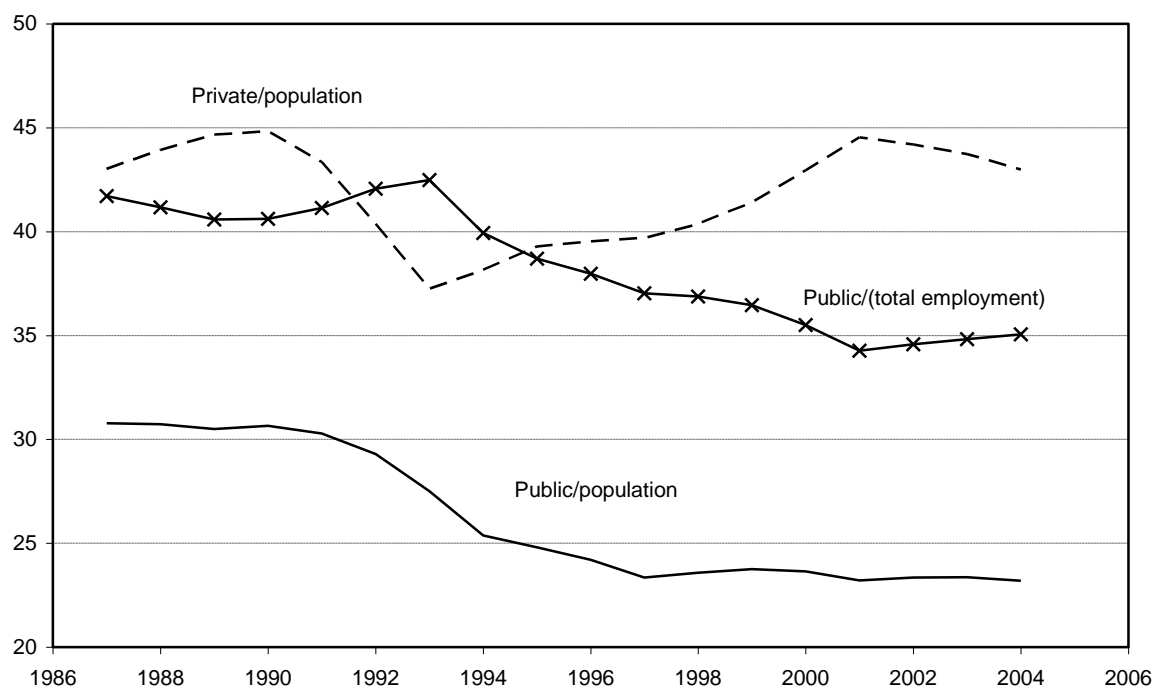
Figures

Figure 1: Employment to population ratio, 16-64 year-olds, 1976-2004, percent



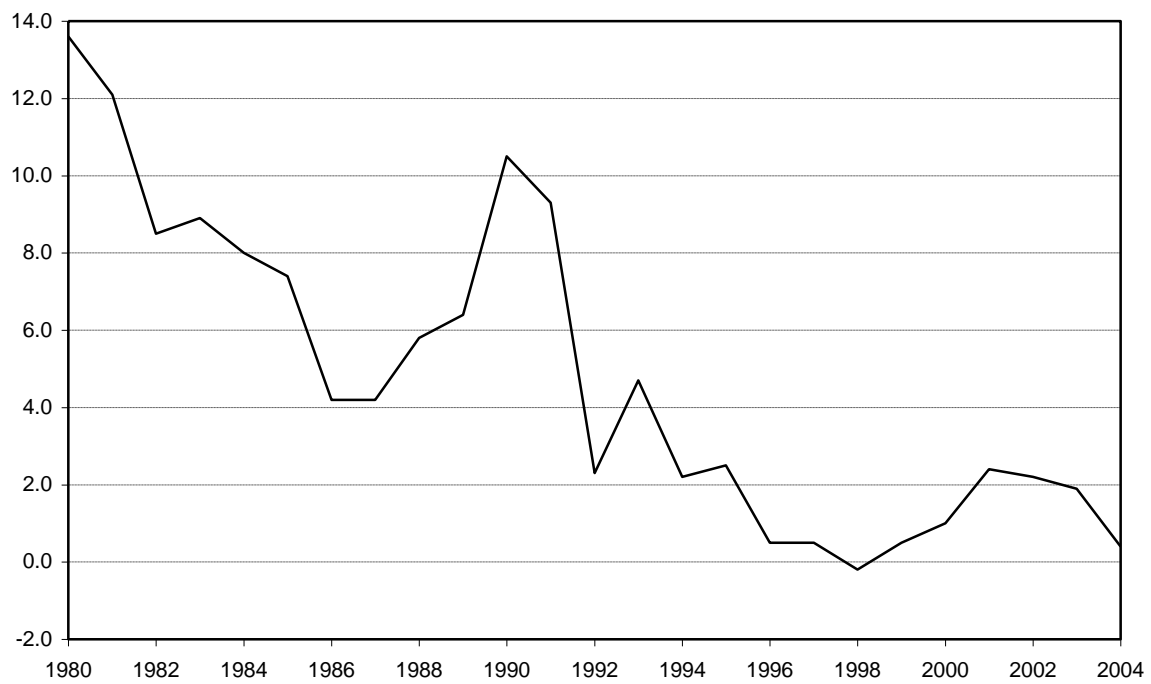
Source: Labor Force Surveys

Figure 2: Private and public sector employment, 1987-2004, percent



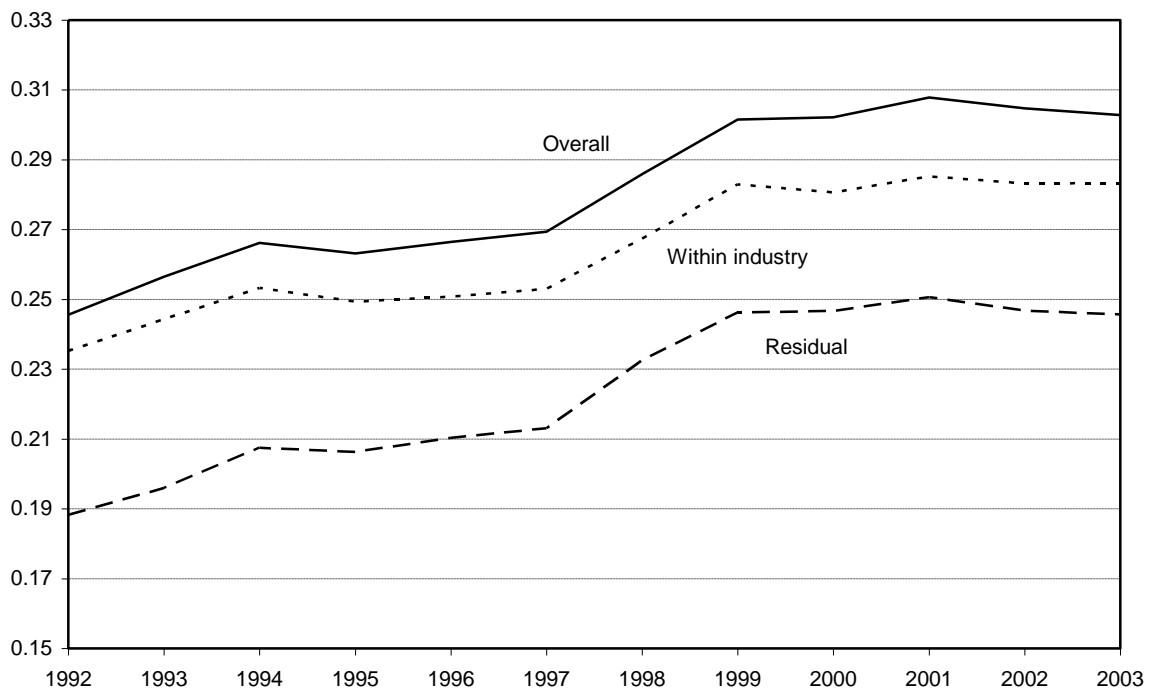
Source: Labor Force Surveys

Figure 3: Rate of inflation (based on the CPI), 1980-2004, percent



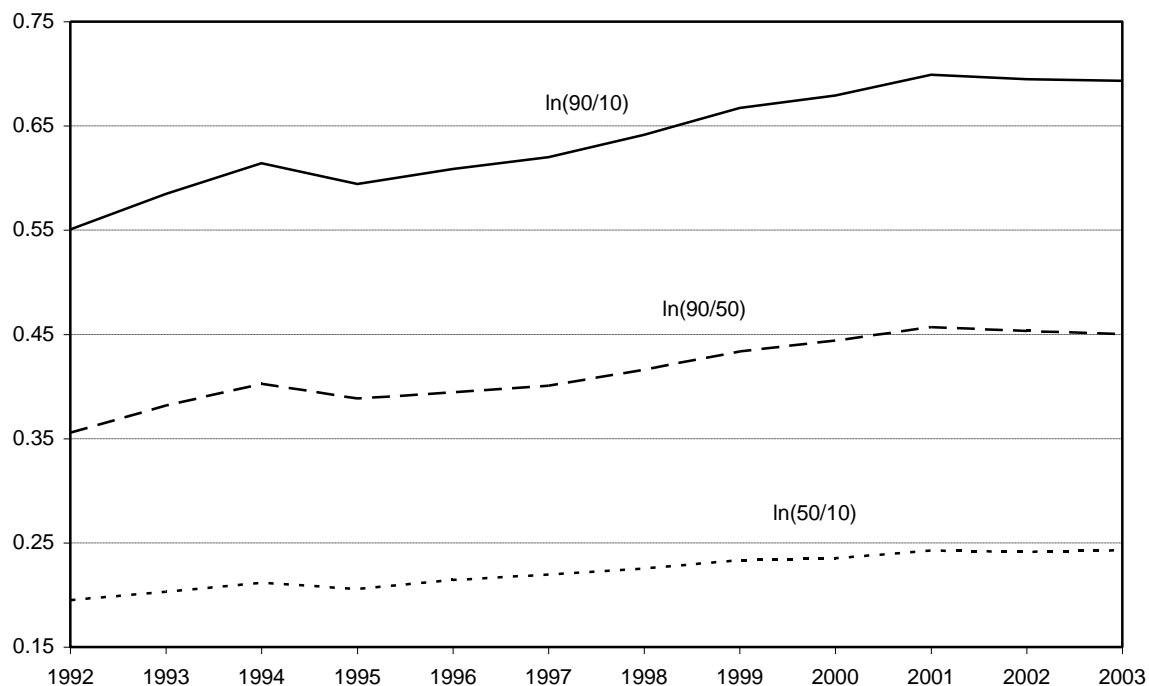
Source: Statistics Sweden

Figure 4: Overall and residual standard deviation of log wages



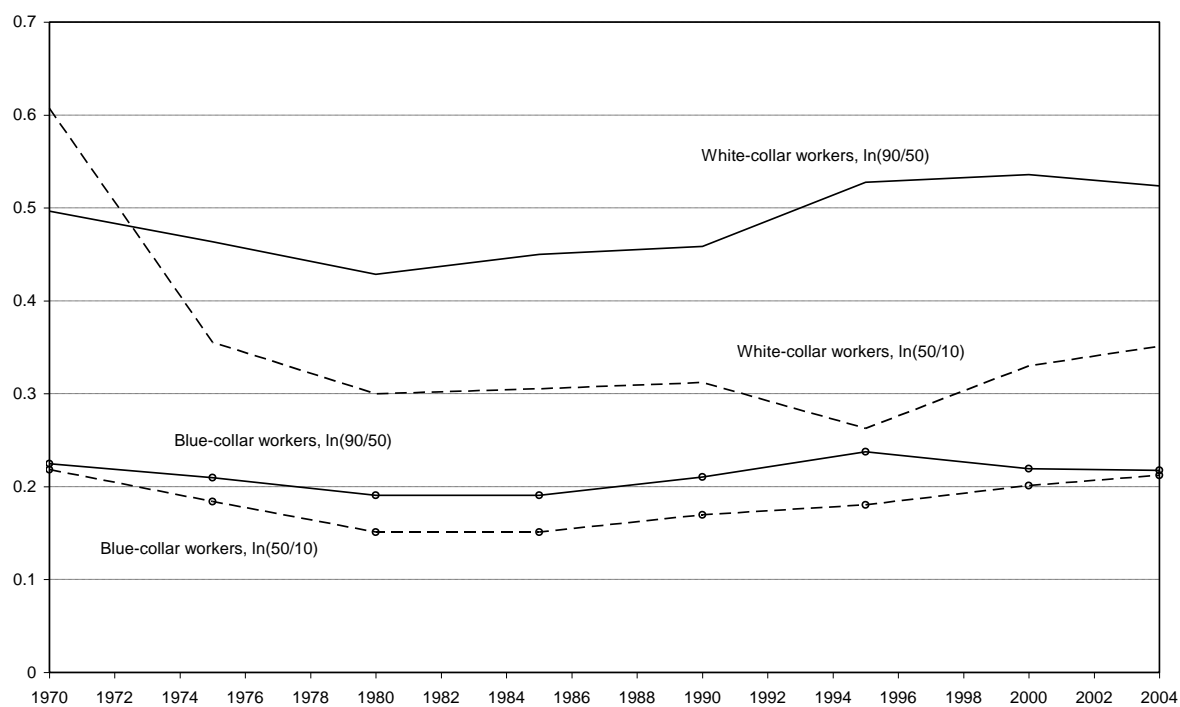
Source: Calculations based on LINDA.

Figure 5: Wage differentials at different points in the wage distribution, 1992-2003.



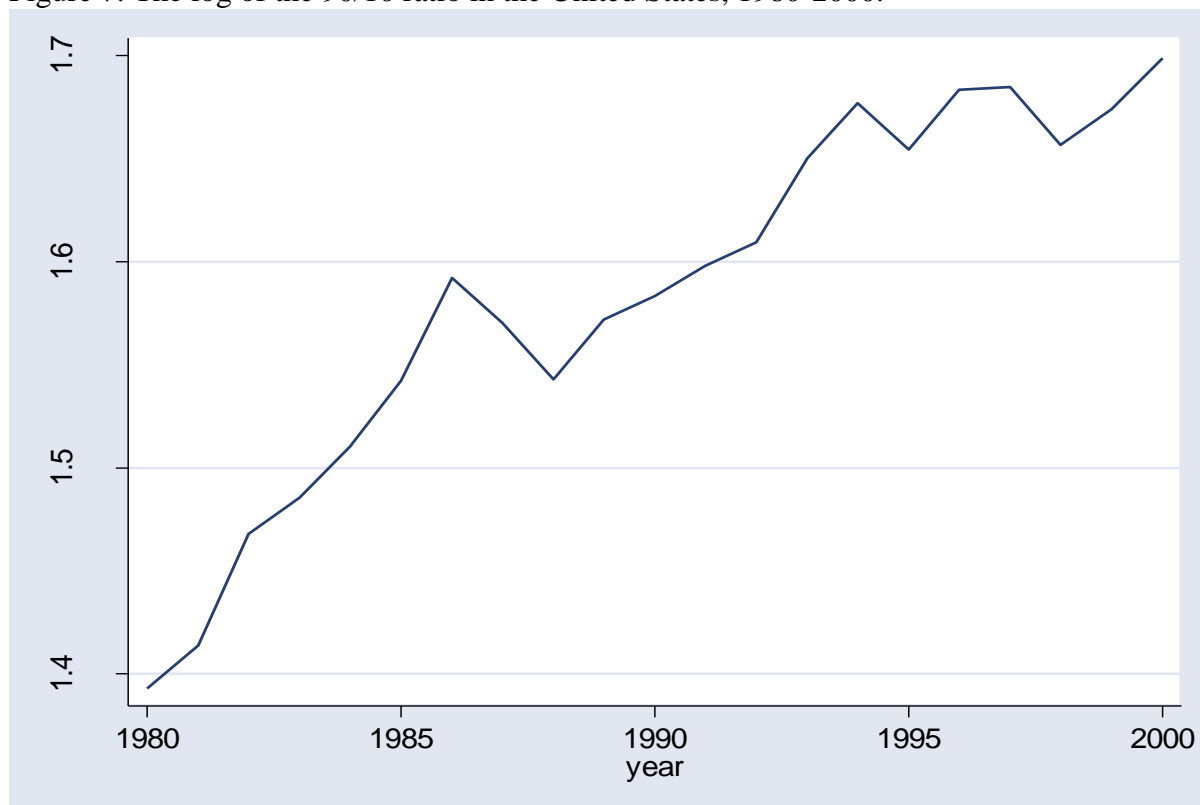
Source: Calculations based on LINDA.

Figure 6: Wage dispersion by worker category in the private sector, 1970-2004



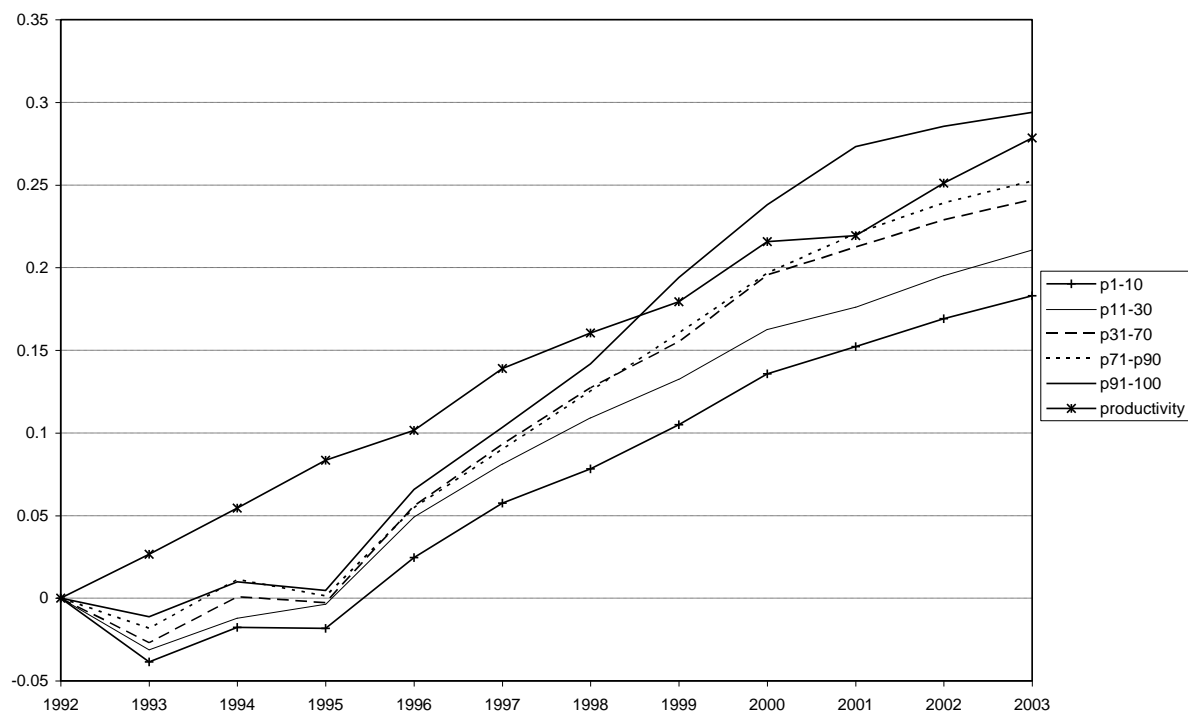
Source: Private sector wage data reported in Larsson (2004) and Lindgren (2005)

Figure 7: The log of the 90/10 ratio in the United States, 1980-2000.



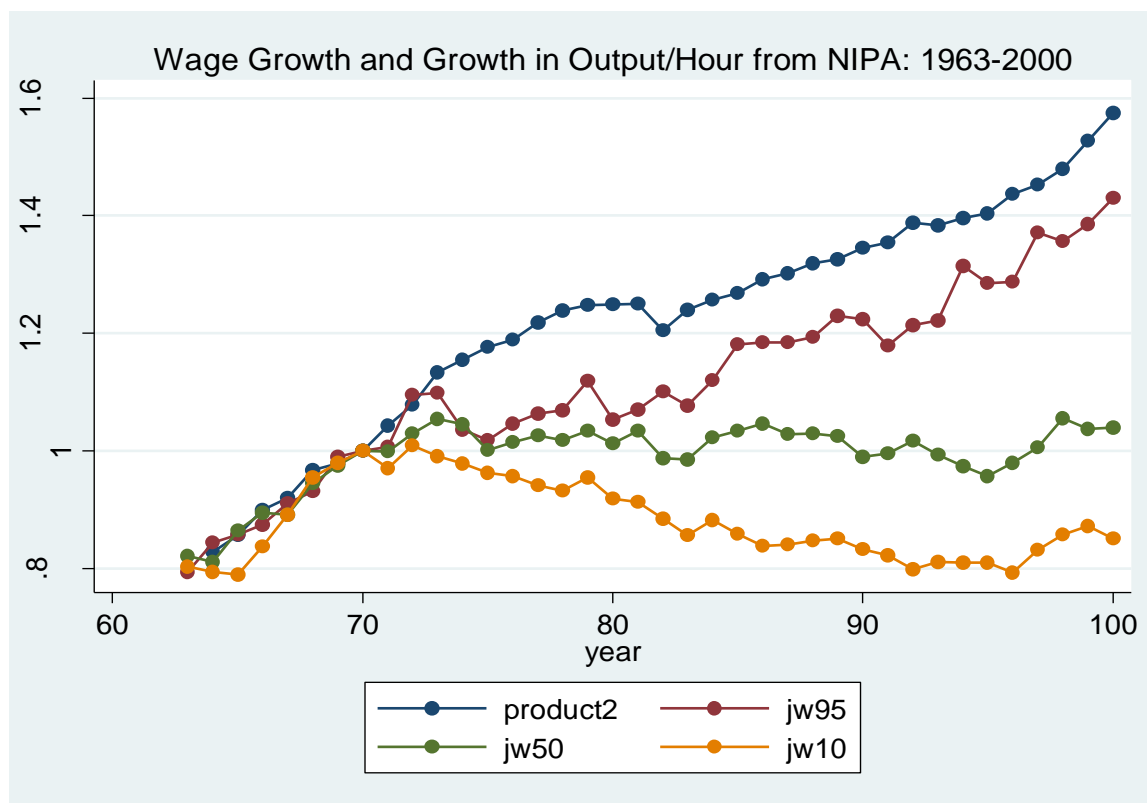
Source: Current Population Survey

Figure 8: Growth in average productivity and real wage growth by skill group, 1992-2003, 1992=0



Source: Productivity comes from Statistics Sweden and the National Institute of Economic Research. Calculations of real wage growth are based on LINDA.

Figure 9: Growth in average productivity and wage growth by wage percentile, 1963-2000, 1970=1



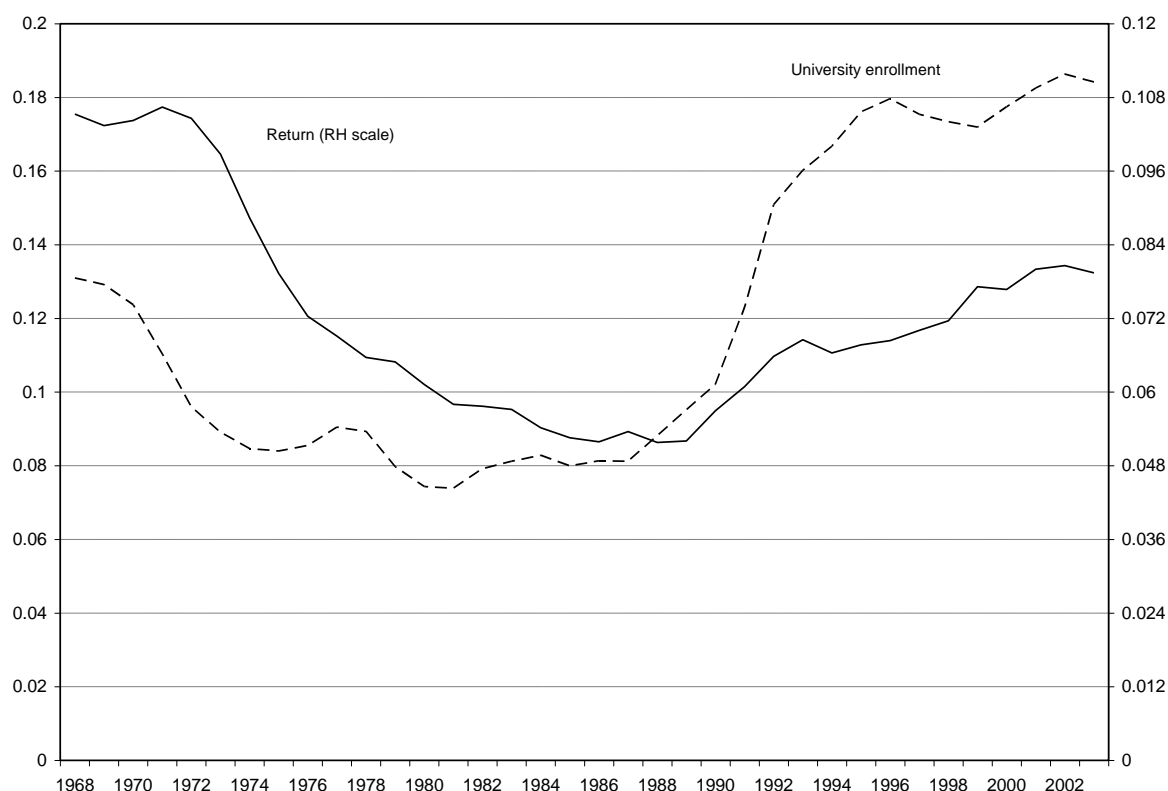
Sources: CPS and NIPA.

Figure 10: Non-employment by skill group, 1992-2003, 1992=0



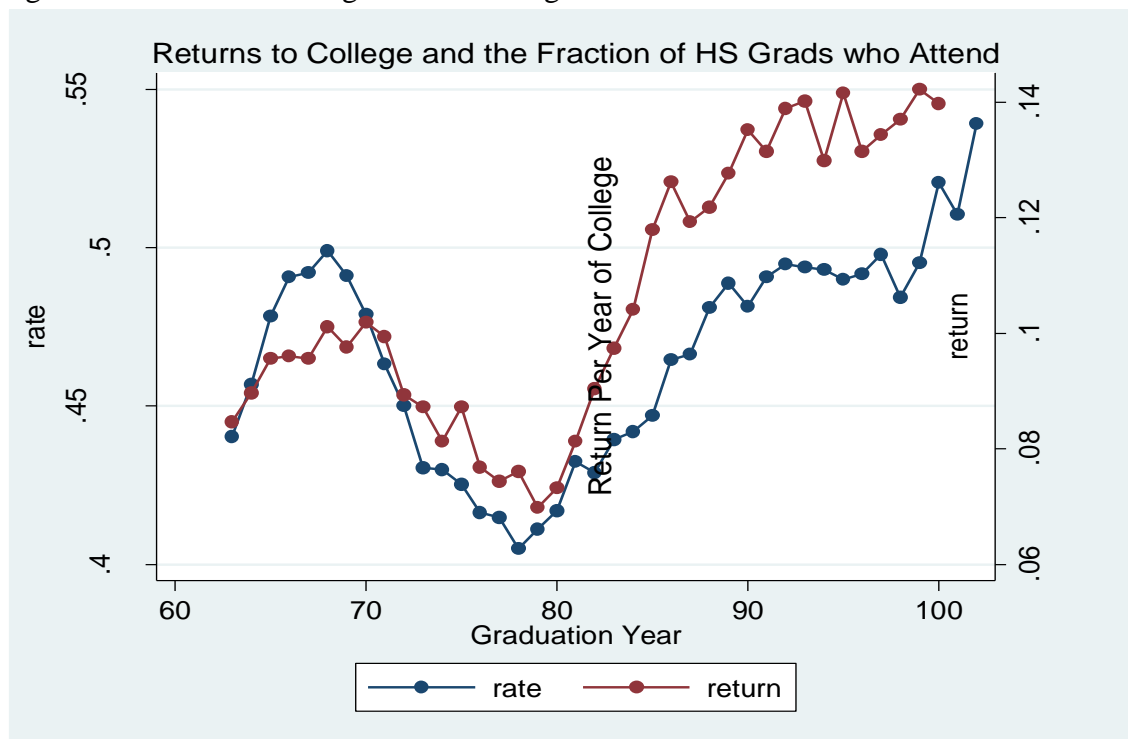
Source: Calculations based on LINDA.

Figure 11: Returns to university and the university enrollment rate in Sweden, 1968-2003



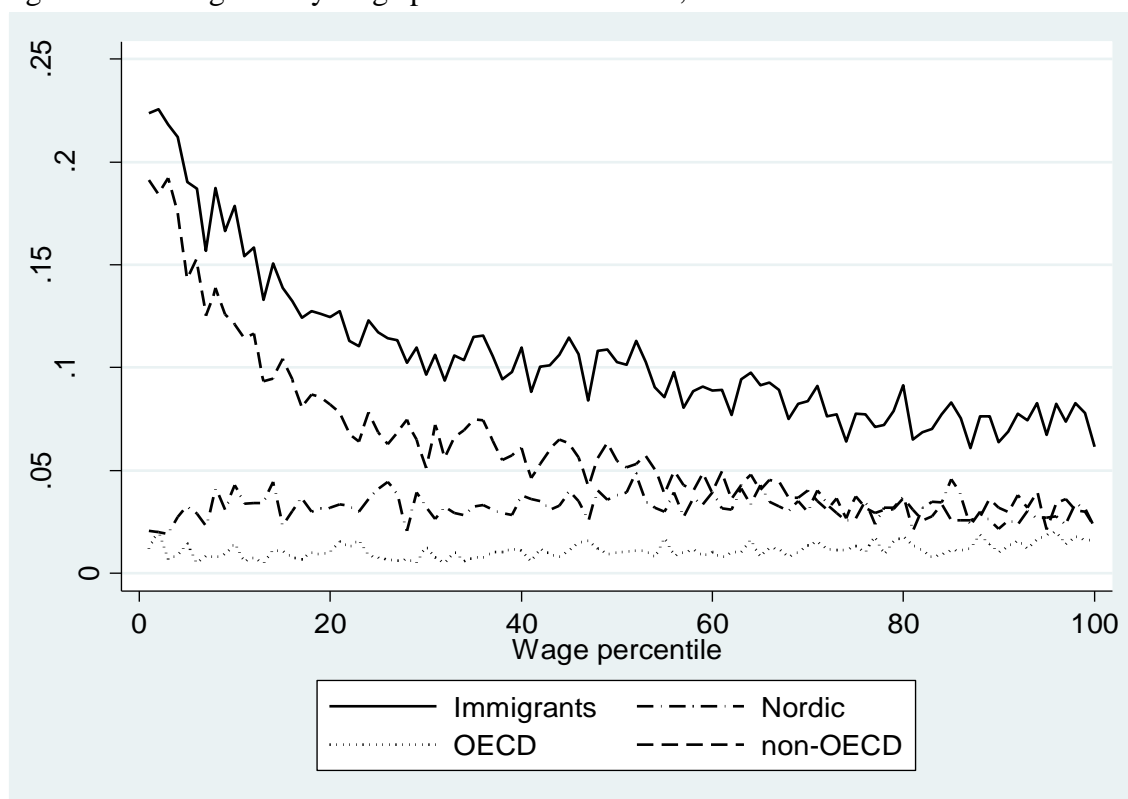
Notes: The university enrollment rate is the # university students less than 22 years-of-age as a fraction of the population aged 19-21. We have adjusted these data for the reform of university education in 1977. The return is in measured in logs and is defined per year of university education. The return has been imputed using earnings regressions for years prior to 1992.

Figure 12: Returns to college and the college enrollment rate in the US



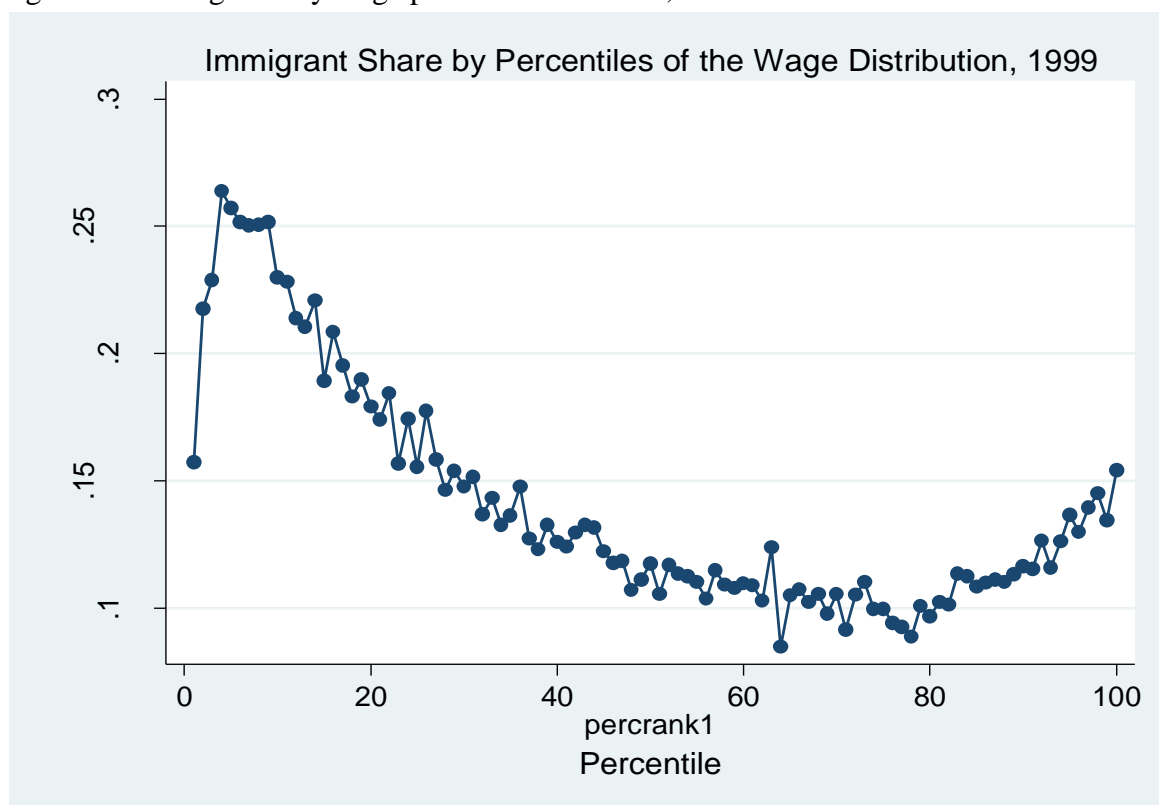
Sources: Calculations based on the CPS.

Figure 13: Immigrants by wage percentile in Sweden, 2003.



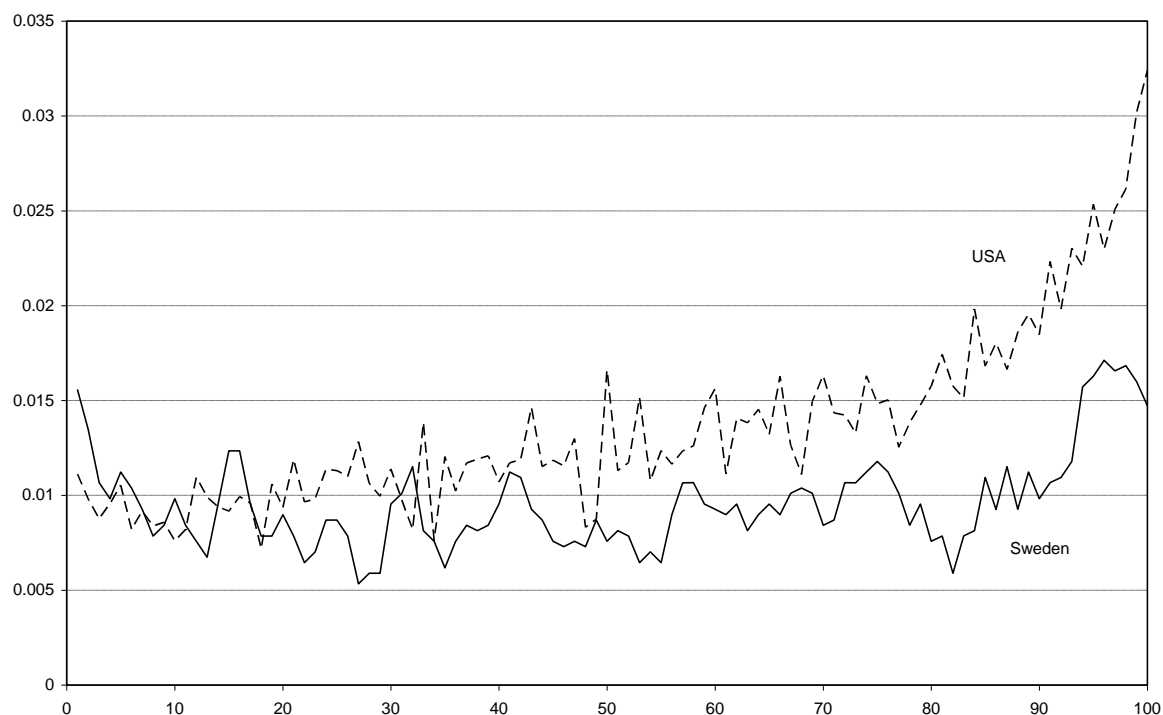
Sources: Calculations based on LINDA.

Figure 14: Immigrants by wage percentile in the US, 1999.



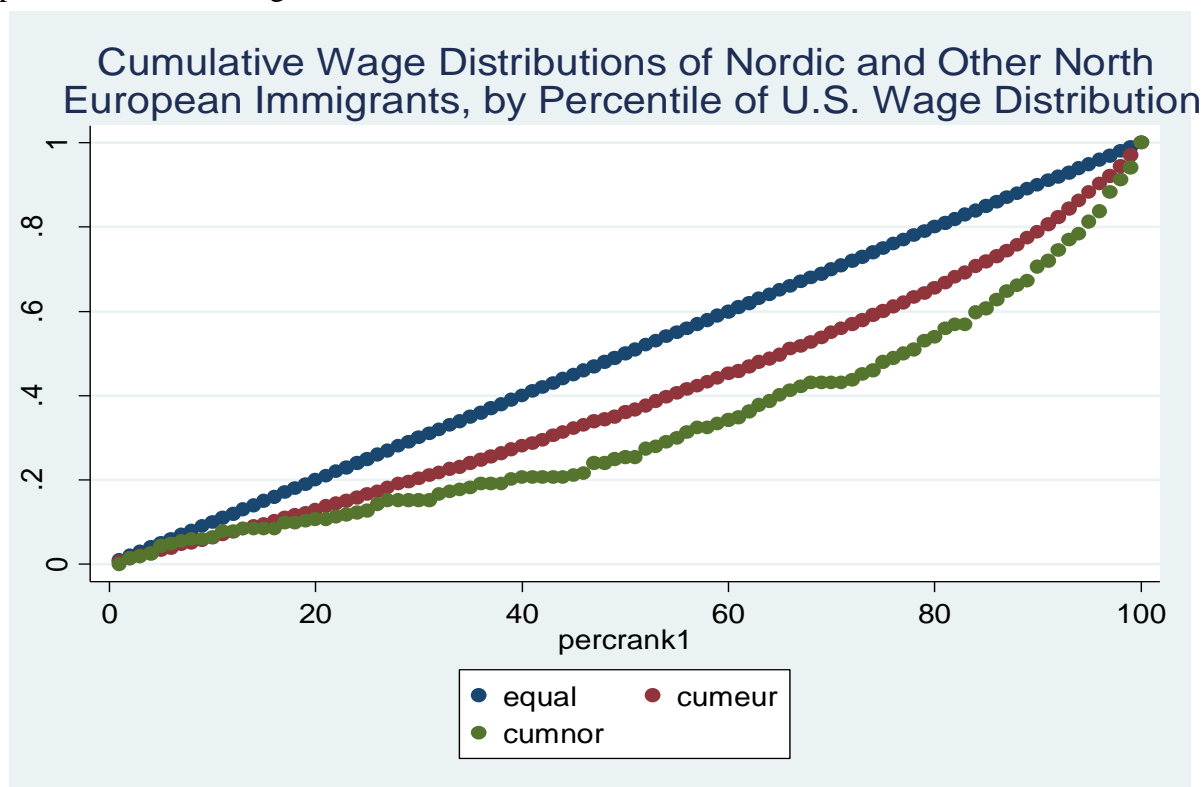
Sources: Calculations based on the Census PUMS.

Figure 15: The share of immigrants from OECD-Europe by wage percentile in the Swedish and US wage distributions



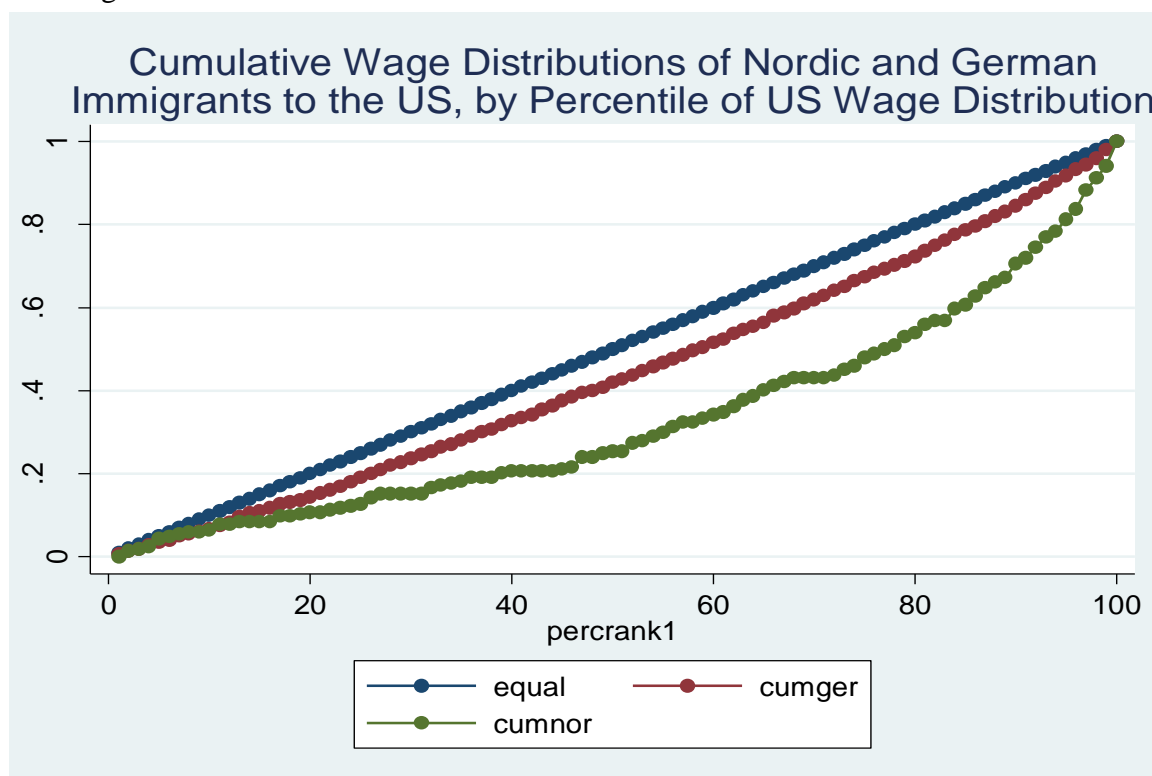
Sources: Calculations based on LINDA (Sweden, 2003) and Census PUMS (U.S., 1999).

Figure 16: Cumulative wage distributions of Nordic and other OECD Europe immigrants by percentile of U.S. wage distribution.



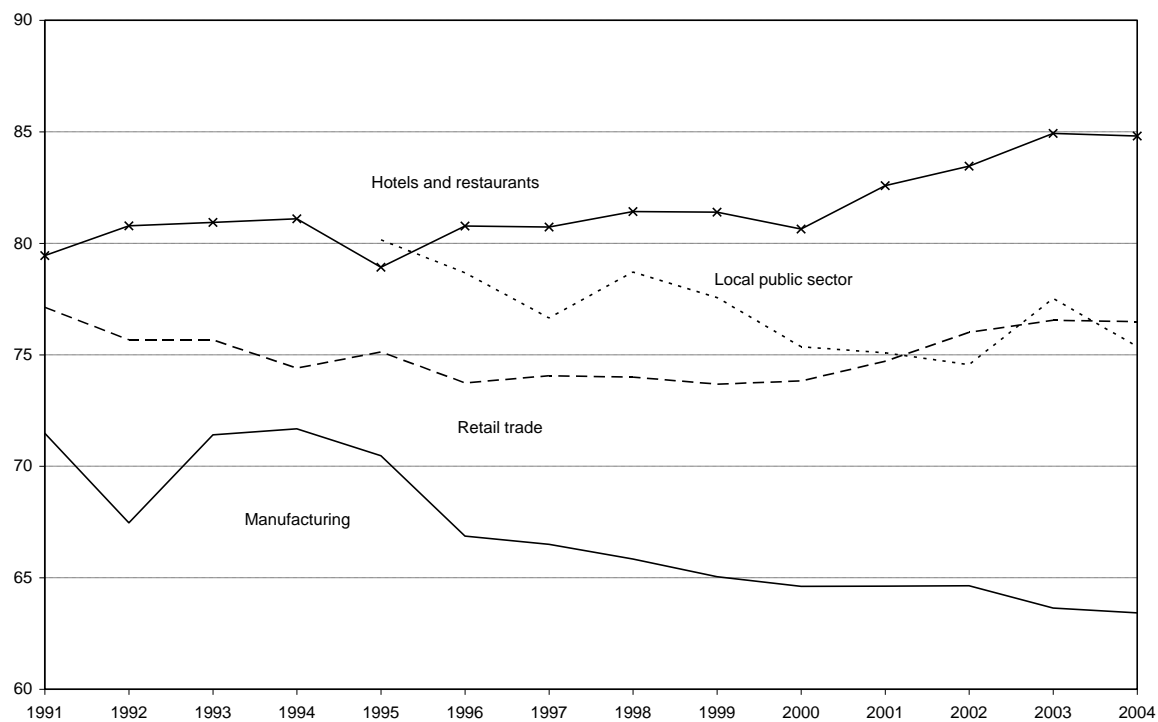
Sources: Calculations based on the Census PUMS.

Figure 17: Cumulative wage distributions of Nordic and German immigrants by percentile of U.S. wage distribution.



Sources: Calculations based on the Census PUMS.

Figure 18: Minimum wage bite by industry, 1991-2004, percent



Source: Minimum wages come from the various wage settlements. Average wages are from Statistics Sweden and the Swedish Municipal Workers' Union.

Figure A1: Standard deviation of log wages, different ways of adjusting pre-1998 data



Figure A2: Different definitions of employment

