Wage-setting Institutions as Industrial Policy*

By

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Abstract: Centralized wage-setting institutions compress relative wages. Motivated by this fact, we investigate the effects of centralized wage setting on the industry distribution of em-ployment. We examine Sweden's industry distribution from 1960 to 1994 and compare it to the U.S. distribution over the same period. We relate U.S.-Swedish differences in the industry distribution and their evolution over time to the structure of relative wages between and within industries. The empirical results identify the rise and fall of centralized wage-setting arrangements as a major factor in the evolution of Sweden' industry distribution. The compression associated with centralized wage-setting shifted the industry distribution of Swedish employment in three respects: away from industries with high wage dispersion among workers, away from industries with a high mean wage, and, most powerfully, away from industries with a low mean wage. By the middle 1980s, these wage structure effects accounted for about 40 percent of U.S.-Swedish differences in the industry distribution. The dissolution of Sweden's centralized wage-setting arrangements beginning in 1983 led to widening wage differentials and a reversal in the evolution of U.S.-Swedish differences in industry structure.

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> [F]or better or worse, for right or wrong, labour economics and the institutions and rules that govern labour markets have moved from the periphery to the center of economic discourse. ... [T]he institutions and rules of the labour market are highly country-specific, and thus plausible contenders for explaining at least some of the differences in outcomes across countries. ... [D]etermining how institutions affect outcomes is a tough business. It will provide us with lots of hard scientific work for some time to come.
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> — Richard Freeman, "War of the Models: Which Labour Market Institutions for the 21st Century?" (1998)

1 Introduction

Second on his "list of eleven things that ... we do know" about how institutions affect outcomes, Freeman (1998) states that "Institutions Reduce the Dispersion of Earnings." He points to collective bargaining, centralized wage-setting, minimum wage laws and progressive taxation as important in this regard. He also cites a variety of studies that provide evidence of a major role for such institutions in compressing wage differentials. Blau and Kahn (1999) sound similar notes in their extensive survey of research on labor market institutions.

Evidence that institutions help shape the wage structure leads directly to other questions about their role in determining outcomes. We pursue one such question: How do labor market institutions that compress wage differentials affect the industry distribution of employment? The logic behind this question is straightforward: If relative wages influence the allocation of workers and cooperating factors of production, then institutional forces that compress wage differentials also affect the structure of employment.

To address the question, we examine the evolution of Sweden's industry distribution of employment from 1960 to 1994 and compare it to the evolution of the U.S. distribution over the same period. We relate the evolution of U.S.-Swedish differences in the industry distribution of employment to the structure of relative wages between and within industries. The results show that the rise and fall of centralized wage-setting arrangements in Sweden

played a major role in the evolution of its industry structure.

Three sets of remarks motivate our analysis and comparative treatment of the Swedish experience. First, collective bargaining dominates the wage-setting process in Sweden. 88% of Swedish employees belonged to a labor union in 1980, as compared to only 20% of U.S. workers in 1983.[1] National differences in wage-setting institutions are even more pronounced than suggested by the union membership figures. From 1956 to 1982, the wage formation process in Sweden was dominated by centralized negotiations between the major employer confederation, SAF, and the largest labor organization, LO. LO advocated and vigorously pursued a "solidarity" wage policy aimed at compressing wage differentials and promoting the restructuring of the Swedish economy away from low-wage sectors. Beginning in the mid 1960s, centralized negotiations also came to play a major role in the wage formation process for most white-collar workers and many professional workers.

Second, Swedish wage-setting institutions were a major determinant of relative wage outcomes. As is well known, Sweden has a compressed wage distribution compared to other advanced economies, especially the United States. There is compelling evidence, recounted in section 2, that Swedish wage-setting institutions brought about a remarkably and increasingly compressed wage distribution between the early 1960s and early 1980s. Moreover, the partial breakdown of Sweden's centralized wage-bargaining regime in 1983, followed by a complete collapse over the next few years, initiated a rapid expansion in wage differentials along a variety of dimensions. The U.S. experience, in contrast, exhibits flat or rising overall wage inequality after the late 1960s, including dramatic and sustained increases in wage inequality beginning around 1980. Thus the Swedish experience offers an attractive laboratory for investigating how institutions that compress wage differentials influence the structure of employment. The U.S. economy, which is characterized by a much smaller role for collective bargaining, in general, and for centralized wage setting, in particular, provides a natural benchmark against which to evaluate the Swedish experience.

Third, there is much to explain in the way of U.S.-Swedish differences in the industry

[1]Table 10.2 in Freeman and Gibbons (1995) and Table 695 in U.S. Bureau of the Census (1995).

employment distribution and in the evolution of these differences over time. Based on a detailed concordance between the U.S. and Swedish industrial classification systems that we constructed for this study, we find a modest narrowing of the gap between the employment distributions in the two countries from 1960 to 1970, considerable divergence between 1970 and the middle or late 1980s, and a sharp narrowing of the distance after the mid 1980s.

Some previous work investigates the effects of Swedish wage-setting institutions on the structure of employment. Edin and Topel (1997) show that employment grew more rapidly from 1960 to 1970 and from 1970 to 1990 in Swedish industries that had (a) higher initial wages and (b) more rapid wage growth. Davis and Henrekson (1997, 1999) show that the industry distribution of employment in Sweden tilts away from low-wage towards high-wage and, especially, medium-wage industries relative to the U.S. distribution as of the mid 1980s. Both studies favor the view that wage compression promoted the restructuring of the Swedish economy away from low-wage industries.

Our study differs from and improves upon earlier work in several respects: First, our data set covers a longer time period, contains more frequent observations, and uses finer industry classifications outside the manufacturing sector. Better data enable us to more closely relate wage structure variables and wage-setting institutions to the timing and nature of changes in U.S.-Swedish differences in the employment distribution. We pursue a difference-in-difference style of investigation in this study, whereas Edin-Topel mainly examined differences over time within Sweden and our earlier work mainly examined between-country differences at a point in time. Second, we consider how within-industry wage dispersion relates to the employment distribution, whereas earlier work considers only the role of industry-level mean wages relative to the overall mean wage. Third, we distinguish between the effects of systematic variation in the structure of wages associated with standard human capital variables and components of the wage structure that reflect residual wage variation. Much evidence indicates that wage-setting institutions more sharply compress wage differentials along dimensions that are not associated with easily observed attributes of workers or jobs.

The paper proceeds as follows. Section 2 describes Swedish wage-setting institutions and relative wage outcomes. This discussion motivates several hypotheses about the impact of wage-setting institutions on the industry distribution of employment. Section 2 also identifies other policies and developments that reinforced the effects of wage-setting institutions or facilitated a compression of wage differentials. Section 3 describes the evolution of U.S.-Swedish differences in the industry distribution of employment and documents how the between-country differences relate to industry-level measures of worker schooling intensity, mean wages and wage dispersion. Section 4 sets forth and investigates several hypotheses about the role of wage structure variables in accounting for U.S.-Swedish differences in the industry distribution of employment and their evolution over time. Section 5 summarizes the empirical findings and discusses some of their implications.

2 Sweden's Wage Structure and Institutional Setting

2.1 A Compressed Wage Distribution

Comparisons of national wage structures in the 1980s and 1990s place Sweden among the set of countries with the least earnings inequality. Table 1 highlights the comparatively compressed nature of the Swedish earnings distribution using data on hourly wages for men in 15 countries. As of 1990 or thereabouts, Sweden has the lowest 90-10 ratio of hourly wages and the highest 10-50 ratio. In both respects, the United States stands far away at the opposite end of the spectrum. More detailed and extensive international comparisons of wage dispersion such as Blau and Kahn (1996) also place Sweden and the United States at or near opposite ends of the earnings inequality spectrum.

Compared to other countries, especially the United States, Sweden also has narrow wage differentials along a variety of specific dimensions. As of the 1980s, Sweden had a comparatively narrow male-female wage gap (Blau and Kahn, 1995), a small discount on wages for new entrants relative to more experienced workers (Edin and Topel, 1997), a

low return to job tenure (Edin and Zetterberg, 1992), a low return to schooling (Edin and Holmlund, 1995 and Edin and Topel, 1997) and small industry wage differentials (Edin and Zetterberg, 1992). In short, the Swedish wage distribution is relatively compressed compared to most other countries and highly so compared to the United States.

In large measure, the stark contrast between Swedish wage compression and U.S. wage dispersion reflects very different evolutions of wage inequality in the two countries from the mid 1960s to the early 1980s. Figure 1 highlights this fact. The figure plots a standard measure of U.S. wage inequality alongside three measures of Swedish wage inequality that are based on independent data sources. All three data sources point to sharply declining wage inequality in Sweden until the early 1980s and growing inequality thereafter. Edin and Topel (1997, Table 4.2) find a very similar time-series pattern in Swedish returns to schooling.[2] Hibbs and Locking (1998, Figure 1) find declines in Swedish wage inequality among blue-collar workers in the private sector after 1962, the start of their sample period, and very rapid declines after 1965. They report that the squared coefficient of variation for blue-collar wages declined by a "whopping 75 percent" between 1962 and 1983.

In short, U.S. and Swedish wage inequality levels appear similar in the late 1960s, but they diverged very rapidly over the next decade and a half.[3] As we discuss below, the 1983 trough in Swedish wage inequality coincides with the breakdown in centralized wage-setting patterns.

[2]However, their Table 4.1 shows stable or declining returns to experience in Sweden throughout the period from 1968 to 1988.

[3]Given the pitfalls in simple comparisons of wage inequality across countries, the different time-series behavior of U.S. and Swedish inequality in Figure 1 deserves more weight than the apparently similar level of inequality in the late 1960s. In this regard, we note that the unweighted standard deviation of log hourly wages in the U.S. data set is larger than the hours-weighted measure shown in Figure 1 by .02 to .05, depending on year. It is also worthwhile to stress that Figure 1 reports pre-tax, pre-transfer measures of earnings inequality.

2.2 The Role of Wage-Setting Institutions

A large body of research associates "institutions", especially collective bargaining and centralized wage setting, with compressed wage differentials and lower earnings inequality. Freeman (1998) summarizes our knowledge in this regard as follows:

> In countries with union and nonunion workplaces, inequalities are smaller in the union setting. Inequality declines among workers who shift from nonunion jobs to union jobs; and increases among workers who move in the other direction. Across countries, central bargaining narrows pay gaps, even though significant wage drift could potentially undo the centrally bargained compression of wages. And changes in institutions, be it declines in collective bargaining coverage as in the US or UK or the breakdown of centralized negotiation between the major union federation and major employer association, as in Sweden, or the end of the Scala Mobile, as in Italy, produce wider earnings distributions.

This summary reflects a rich smorgasbord of evidence accumulated from many studies, many countries and a variety of episodes and comparisons. We refer the reader to Freeman (1998) for further discussion and to Blau and Kahn (1999) for an extensive survey of the relevant literature. We focus here on Swedish wage-setting institutions and their effects on the wage structure.[4]

Collective bargaining dominated the wage formation process in Sweden throughout the period covered by our study. The era of sharp compression in wage differentials contains two distinct phases of centralized, "solidarity" bargaining. The first phase, extending through the late 1960s, emphasized "equal pay for equal work" and is associated with the leveling of wages across industries, regions and plants. The second phase, running from 1969-70 through 1982 and often caricatured as "equal pay for all work", is associated

[4]The following discussion draws on conversations with several persons mentioned in the acknowledgements and on Ahlén (1989), De Geer (1992), Elvander (1988), Elvander and Holmlund (1997), Freeman and Gibbons (1995), Nilsson (1993) and Hibbs and Locking (1998).

with the leveling of wages across workers and occupations within industries and plants. A third phase, which began in 1983, saw the dissolution of centralized wage setting and the expansion of wage differentials along many dimensions. Failed efforts by the Swedish government to re-institute centralized wage bargaining in 1989 effectively marked the end of the regime (Freeman and Gibbons, 1995, Hibbs and Locking, 1998). For a large fraction of the workforce after 1983 and the vast majority of all workers after 1988, wages were determined by industry-level and plant-level bargaining.

Under the centralized regime, wages were largely determined as the outcome of detailed negotiations between national bargaining organizations that represented employers and unions. The most important negotiations, especially prior to the 1970s, took place between SAF, the leading association of employers, and LO, a federation of blue-collar unions.[5] From 1956 to 1982, SAF and LO regularly negotiated central framework agreements that governed wage setting for all blue-collar workers in the Swedish private sector. These framework agreements were implemented through subsequent rounds of industry-level and plant-level bargaining. Wage drift – i.e., individual wage supplements and locally bargained wage increases in excess of central framework agreements – was moderate under the centralized wage-setting regime, although its importance grew after the mid 1970s (Ahlén, 1989).

During the 1950s and 1960s, the LO-SAF agreements invariably preceded the ones involving white-collar workers, and the agreements negotiated by the white-collar unions closely mirrored the terms of LO-SAF agreements. However, the agreements for white-collar workers allowed greater individual wage variation and more scope for wage drift. Adjustments for wage drift were explicitly factored into the agreements involving the LO and public sector unions. In particular, these agreements provided retrospective pay adjustments in response to wage drift among white-collar workers in the private sector. The importance of contractually specified adjustments for wage drift gradually diminished dur-

[5]As of the late 1980s, SAF represented 40,000 firms in private industry, including all of the largest ones, and LO represented 90 percent of blue-collar workers (Ahlén, 1989, page 331).

ing the 1970s (De Geer, 1992). As an outcome of these arrangements, relative wages between blue-collar and white-collar workers were, to a considerable extent, stipulated by central level agreements until the early 1980s.

Formal arrangements for centralized wage setting developed later for white-collar workers than for blue-collar workers. Wage negotiations in the public sector became increasingly centralized beginning in 1966 and fully centralized following severe labor conflicts in 1970-71. The centralized wage-setting process in the public sector was very strongly oriented to the narrowing of wage dispersion and remained largely intact until the late 1980s (Elvander, 1988, Elvander and Holmlund, 1997).

Beginning in 1966, wage setting for most white-collar workers in the private sector also came to be determined in national negotiations between SAF and PTK, the chief cartel for private sector white-collar unions. By 1970-71, a national system of centralized wage bargaining for white-collar workers was firmly in place.[6] This arrangement lasted until 1988, when the engineers' union broke out and struck a separate agreement with their employers' federation (Elvander and Holmlund, 1997).

Several aspects of the wage-setting apparatus in Sweden helped to monitor and enforce the central framework agreements. First, until 1990 the SAF collected wage statistics for all employees of member firms. Second, a firm risked retaliation by labor unions if it raised wages for highly skilled workers above the levels prescribed by the central framework agreement. Third, the SAF charter authorized fines and sanctions against firms that deviated from the central agreement.[7] Fourth, the SAF controlled a large "conflict fund" that could be drawn upon by SAF employers in good standing who were involved in lock outs or strikes. So, a firm that deviated from the framework agreement invited retaliation from

[6]University-educated professionals, as distinct from white-collar workers, accounted for only a small (but growing) fraction of the Swedish workforce during the centralized wage-setting era. However, even for many professionals, wages were determined by centralized bargaining.

[7]Fines and sanctions were occasionally imposed. Volvo, for example, was subjected to fines in the early 1970s when it raised wages above the central framework agreement in order to attract higher quality workers.

labor unions at the same time as it risked losing access to the conflict fund. Finally, the SAF had a long history of centralism and internal discipline that discouraged competition among firms on the basis of worker compensation.

These wage-setting arrangements did not develop in an economic or ideological vacuum. In Sweden, the idea of centralized wage bargaining as a means to achieve solidarity among workers and reduce wage inequality dates back to at least 1936 and was forcefully advocated by prominent LO economists in the late 1940s and early 1950s. By 1956, this view had been adopted by LO leadership. For different reasons, leading Swedish employers also favored centralized wage determination in the early postwar decades. As Hibbs and Locking (1998) write, "SAF also took a leading role in promoting the development of national bargaining, because large-scale manufacturing firms comprising SAF's most important constituency believed that centralization would inhibit wage pressure from powerful unions in sheltered sectors from spilling over to wage settlements in the competitive, traded goods sector."

"Equal pay for equal work", regardless of employer profits or ability to pay, was the guiding principle during the first phase of centralized wage determination. Advocates for this principle argued that it would promote worker solidarity *and* the restructuring of the economy toward more profitable and productive firms and sectors (Edin and Topel, 1997). This restructuring argument resonates with theories that interpret wage differentials among firms and industries as indicative of departures from efficient factor allocations in an idealized competitive setting.[8] By all accounts, the weight accorded to the restructuring objective diminished after 1970, and wage compression in and of itself came to dominate the rhetoric of wage-setting negotiations and the content of compensation agreements.

In summary, centralized wage setting took root among blue-collar workers in 1956 and played a leading role in wage formation throughout the Swedish economy. Formal arrangements for centralized wage setting spread to white-collar and public sector workers in the second half of the 1960s. The centralized regime remained intact until 1983, when key defections initiated a process of dissolution that was effectively complete by 1989. A broad

[8]See, e.g., Hibbs and Locking (1998) for an elaboration on this point.

consensus among participants and researchers holds that the rise of centralized wage-setting arrangements was a major force behind the increasing compression of Swedish wage differentials in the period leading up to 1983, and that the demise of these arrangements led to widening wage differentials. [9]

This account motivates several hypotheses about the impact of wage-setting institutions on the industry distribution of employment: First, Sweden's centralized wage-setting regime disfavored industries that, for efficiency reasons, have high wage dispersion. Second, the centralized regime likewise disfavored industries with mean compensation levels nearer to the tails of the industry wage structure. Third, the centralized regime had stronger adverse effects on employment in low-wage than high-wage industries. This third hypothesis reflects two considerations. One, key participants in the centralized wage-setting process explicitly advocated wage floors as a tool to promote the restructuring of the economy away from low-wage sectors. There was no corresponding impetus to restructure the economy away from high-wage sectors. Two, while upward wage drift at the industry and local levels was subject to some penalties, it still functioned as an escape valve when centrally negotiated wages were set too low for highly productive industries, plants or workers. There was no corresponding escape valve when nationally bargained wages were set too high at the low end.[10]

Our account of Swedish wage-setting arrangements also makes predictions about the timing of these effects. In particular, we hypothesize that the effects on industry structure first intensify over time, reaching a peak around the middle 1980s, and then subside after the middle to late 1980s in response to the demise of centralized wage setting. We give these hypotheses a more precise formulation and test them in Section 4.

[9]Freeman and Gibbons (1995) analyze the economic forces that contributed to the breakdown of centralized bargaining.

[10]In other countries, too, centralized wage-setting institutions more rigidly compress the wage structure at the low end than at the high end. See Blau and Kahn (1996) for some evidence.

2.3 Complementary and Reinforcing Policies

Sweden pursued several economic policies that reinforced or facilitated the effects of its wage-setting institutions on the industry distribution of employment. The most important policy development for our purposes was the dramatic expansion in public employment after 1960, mainly in the form of social services supplied by the local government sector. [11] Public sector employment growth facilitated wage compression in two ways. First, it propped up demand for less skilled and lower wage workers, which made it easier to raise wages near the low end without causing high unemployment (Edin and Topel, 1997). Second, the rise in public employment involved a major shift towards a sector with low wage dispersion.

We document the timing and magnitude of the Swedish employment shift towards social services in section 3. This shift continued through the middle 1980s and, hence, overlaps with the rising importance of centralized wage-setting institutions. However, there is no abrupt reversal in this phenemonon after 1985 that mirrors the breakdown of centralized wage setting. Hence, the rise and *fall* of centralized wage setting provides leverage to isolate an independent effect of wage-setting institutions in the context of an expanding and expansive welfare state. In addition, the results reported in section 4 hold up when we restrict the sample to exclude industries in the Public Administration and Welfare sectors.

Sweden also levies high rates of taxation on labor income compared to the United States and most other countries. Given a flat rate schedule, higher tax rates compress the after-tax earnings distribution compared to the pre-tax distribution. Sweden's tax rate schedule for labor income also looks highly progressive on the surface, although that assessment is less secure upon careful examination (Normann and McClure, 1997). But, on the whole, the available evidence indicates that the distribution of disposable earnings in Sweden is even more compressed, relative to other countries, than suggested by the evidence in Table 1 and Figure 1 (Björklund and Freeman, 1997). The high rates of labor taxation in Sweden and

[11] See Rosen (1997) for an extended and insightful analysis of this development.

the egalitarian nature of its tax and transfer system reinforced the effects of a compressed wage structure on labor supply.

The taxation of business income probably played some role in facilitating the effects of centralized wage setting on the industry structure. Two aspects of the Swedish tax system are noteworthy in this regard. First, Sweden has high statutory tax rates on corporate profits but much lower effective tax rates because of accelerated depreciation provisions and other loopholes. Capital-intensive manufacturing industries, which tend to have high mean wages and low wage dispersion, can more readily exploit these loopholes than most other industries. Second, institutional ownership by pension funds and life insurance companies is heavily tax-preferred in Sweden as compared to direct business ownership by households. This aspect of the tax system disfavors owner-operated personal and business services, which tend to have relatively low mean wages and high wage dispersion. [12]

Two labor market interventions in Sweden also deserve mention. First, tight job security provisions increased relative labor costs in high turnover industries, which tend to pay low wages and employ less skilled workers (Davis and Henrekson, 1999). This policy reinforced the adverse relative cost effects of centralized wage setting on low-wage industries. Second, active labor market policies propped up demand for worker who were displaced from declining sectors and may have eased their reallocation to expanding sectors (Forslund and Krueger, 1997).

Like public sector employment expansion, the active labor market policies and the Swedish system of business taxation helped to facilitate the effects of centralized wage-setting institutions on the industry distribution, while forestalling the emergence of high unemployment rates. In contrast, tight job security provisions and high rates of personal taxation reinforced certain effects of centralized wage setting.

[12]Davis and Henrekson (1999) discuss Swedish taxation of business income in greater detail. They also provide evidence on the magnitude of certain tax wedges associated with the taxation of business income, including evidence that these wedges are larger in Sweden than in the United States and other countries.

2.4 The Role of the Skill Distribution

To what extent does Sweden's compressed wage distribution simply reflect an equally compressed distribution of skills? Björklund and Freeman (1997) pursue this question at some length. They provide several pieces of evidence that point to a more egalitarian system of human capital formation in Sweden than in most other high income countries: Sweden has relatively low child poverty rates, relatively intact family structures, widespread and highly subsidized day-care facilities, an egalitarian allocation of resources in (primary and secondary) education, and relatively little variation in test scores among schools. [13]

Furthermore, theories of the intergenerational transmission of human capital (e.g., Becker and Tomes, 1993) suggest that Sweden's narrow earnings distribution and progressive tax system are likely, over time, to bring about a more compressed distribution of "ability" among workers. While direct evidence on the intergenerational transmission of ability and human capital is hard to come by, many studies examine the relationship between sons' and fathers' earnings. Based on a simple regression model of this relationship, Björklund and Freeman carry out a variance decomposition exercise and conclude that the more compressed distribution of earnings among Swedish fathers can account for – at most – 30 percent of the gap between the United States and Sweden in the dispersion of male earnings. Their estimates also point to a much lower correlation between fathers' and sons' earnings in Sweden (.25) than in the United States (.4).[14] Taken at face value, the lower correlation for Sweden fits well with the view that, aside from the distribution of family resources, Sweden has an egalitarian system of human capital formation.

Björklund and Freeman read these facts as evidence that the greater equalization of backgrounds in Sweden is not sufficient to explain the greater equalization of earnings. In their words (p. 61), "Producing an egalitarian distribution requires direct intervention in the income determination process." Hibbs and Locking (1996) and Edin and Topel (1997)

[13]Some facts point in the other direction. For example, Björklund and Freeman report that years of schooling among adult men is more dispersed in Sweden than in the United States.

[14]See, also, Björklund and Jäntti (1997).

arrive at similar assessments based on quite different evidence and analyses. While each piece of evidence in these studies is susceptible to alternative interpretations, the whole body of evidence strongly favors the view that wage-setting institutions and direct policy interventions played a major role in bringing about Sweden's compressed wage structure and its evolution over time.

This conclusion about the importance of institutional forces does not deny a role for conventional market forces in the evolution of Swedish relative wages. Edin and Holmlund (1995), for example, argue that much of the time-series behavior of Swedish education and experience differentials can be explained by relative supply shifts. In any event, our empirical strategy for identifying the effects of institutionally induced wage compression on the industry distribution of employment requires only that wage-setting institutions attenuated the magnitude of swings that would have occurred in a decentralized wage-setting regime.

3 U.S.-Swedish Differences in the Industry Distribution of Employment

3.1 Divergence and a Partial Reversal

To examine U.S.-Swedish differences in the industry distribution of employment, we constructed panel data on industry-level outcomes in the two countries at roughly five-year intervals from 1960 to 1994. Appendix A describes our data sources and explains how we constructed industry-level measures of employment and other variables. Appendix B lists the 61 industries and describes the concordance that we prepared for the U.S. and Swedish industrial classification systems.

Based on these data, Table 2 shows three measures of distance between the U.S. and Swedish employment distributions for various years from 1960 to 1994. The table reports

time series for the weighted mean of the absolute log employment share ratios,

$$LD_t = \sum_i 0.5\big(S_{it}^{US} + S_{it}^{SW}\big)\,|\log(S_{it}^{US}/S_{it}^{SW})|, \tag{1}$$

the sum of the absolute employment share differences,

$$AD_t = \sum_i |S_{it}^{US} - S_{it}^{SW}|, \tag{2}$$

and the weighted standard deviaton of the log employment share differences,

$$SD_t = \left[\sum_i 0.5\big(S_{it}^{US} + S_{it}^{SW}\big)\left[\log(S_{it}^{US}/S_{it}^{SW}) - \overline{\log(S_{it}^{US}/S_{it}^{SW})}\right]^2\right]^{1/2}, \tag{3}$$

where S_{it} denotes the share of a country's employment in industry i at time t.

The three measures tell similar but not identical stories: a modest narrowing from 1960 to 1970 in the overall distance between the U.S. and Swedish distributions, considerable divergence after 1970 (rapid in the first half of the 1980s), and a sharp narrowing of the distance after the mid 1980s. The standard deviation measure, which gives greater weight to extreme differences, shows a somewhat later onset of the divergence and an earlier start to the reversal. All three measures show sharp divergence followed by an abrupt reversal. In terms of the sum of absolute share differences, the distance between the U.S. and Swedish industry distributions moves almost full circle in the quarter century from 1970 to 1994. The other two measures show a more partial reversal.

Table 3 shows that the 1990-94 convergence, which coincided with a profound recession in Sweden, mainly reflects shifts in the Swedish industry distribution. For the United States, the 1990-94 period was one of quiescence in the industry structure. In other words, the Swedish industry distribution lurched towards the U.S. industry distribution in the early 1990s following an extended period of divergence.

Table 3 also shows that the cumulative change in the industry distribution of employment was considerably larger in Sweden than in the United States. The cumulative sum of absolute employment share changes from 1960 to 1994 is 160 percentage points in Sweden as compared to only 115 points in the United States. Thus, the divergence and partial

reconvergence of the industry distributions in the two countries involved greater shifting over time in the Swedish industry distribution.

3.2 Relative Shifts in Broad Industry Shares

Tables 2 and 3 provide useful information about overall distance and intensity of change in the industry employment distributions, but they say little about the nature of the between-country differences or their changes over time. To help sketch a more detailed picture in these regards, we examine several other measures.

Table 4 reports differences between U.S. and Swedish employment shares for eleven broad industry categories. Some pronounced differences hold up throughout the entire 1960-1994 period. For example, Business Services and FIRE, Lodging and Dining, Personal Services and Trade consistently account for a larger fraction of U.S. employment. Manufacturing and Construction consistently account for a larger fraction of Swedish employment.

More to the point for our purposes are the shifts in relative industry shares over time. Several developments stand out. Most strikingly, Sweden's relative share of employment in Public Administration, Welfare, Health and Education ("Social Services") rose tremendously between 1960 and 1985. As of 1960, this broad category accounted for an extra 2.3 percent of employment in the United States relative to Sweden. By 1970, the situation had reversed and an extra 1.3 percent of Swedish workers were engaged in this sector. Relative Swedish employment in Social Services continued to expand until 1985, by which time it accounted for an *extra one-tenth* of Swedish employment. This strikes us an enormous disparity in the industrial structure of employment for two countries at similar levels of economic development. The huge relative shift towards Social Services from 1960 to 1985 indicates how profoundly the expansion of the Swedish welfare state influenced the structure of the market economy.[15]

[15]As Rosen (1997) stresses, much of this expansion in the Swedish welfare state involves a shift into the

Relative Swedish employment declined from 1960 to 1985 in Lodging and Dining, Business Services, Manufacturing and Construction. For Manufacturing, most of the change occurred in the 1960s. For private sector service industries, the bulk of the changes occurred after 1970. From 1970 to 1985, relative Swedish employment shares fell sharply in Trade, Lodging and Dining, Personal Services and Business Services. These sharp movements away from private sector service employment took place against an initial situation, as of 1960 or 1970, in which private sector service industries already accounted for a relatively small share of Swedish employment.

The about-face from 1990 to 1994 in the evolution of Sweden's industry distribution involved sharp increases in the relative employment shares of Trade and Business Services and declines in Manufacturing and Construction. After contracting from 1985 to 1990, Sweden's relative employment share in Social Services grew modestly from 1990 to 1994, probably as a direct consequence of the severe recession. To reiterate, the "partial reversal" in the evolution of Sweden's industry distribution between 1990 and 1994 does not reflect a scaling down of the welfare state.

3.3 Directional Measures of Distance and Change

Let X_i denote a measurable characteristic of industry i. Consider the weighted mean of X in country c,

$$M_t^c(X) = \sum_i S_{it}^c X_i, \tag{4}$$

where the weight, S_{it}^c, is the share of industry-i employment in c at t. Using this type of index, we quantify directional measures of distance between the U.S. and Swedish industry distributions at a point in time and changes over time. Tables 5-7 report results for X variables that correspond to various industry-level measures of schooling, mean wages and

market sector of activities like child care and elderly care that were traditionally provided in the household sector.

wage dispersion. We rely on U.S.-based measures of industry-level characteristics for reasons of data availability and to maintain consistency with our general approach of treating U.S. outcomes as a benchmark.

Table 5 shows that, as of 1960, the weighted mean years of schooling was 12.66 in the United States as compared to 12.45 in Sweden. The schooling intensity of the industry distribution rose steadily in both countries over the next few decades, but more so in Sweden. Sometime during the second half of the 1970s, the Swedish industry distribution became more schooling intensive than the U.S. distribution, although mean years of schooling remained higher for U.S. workers.

Because formal shooling requirements are high in many public sector jobs, we recomputed the indexes of schooling intensity after excluding employment in Public Administration and Welfare Services. These results, also reported in Table 5, suggest that the expansion of the Swedish welfare state accounts for about one-third of the relative Swedish shift towards schooling intensive industries between 1960 and 1985.

Table 6 reports the weighted mean of log wages in the two countries. The industry-level means are computed from 1984-1986 data on log hourly wages for U.S. workers. [16] As of 1960, the weighted mean is already 1.5 percentage points larger in Sweden, and it proceeds to rise over the next quarter century, especially from 1970 to 1985. Indeed, by 1985, the between-country differences in the industry distribution account for 5.5 percent higher wages in Sweden. This finding supports the view that the "solidarity" wage policy had some success in promoting the restructuring of the Swedish economy towards higher wage industries. The U.S. industry distribution also drifted towards higher wage industries from 1960 to 1980, but the pace was much more rapid in Sweden. More generally, Table 6 suggests that national differences in industry structure can account for nontrivial differences in the level of average wages.

The rightmost two columns in Table 6 break down the indexes into components that

[16] We compute industry-level mean log wages from data on individual workers in the March files of the Current Population Survey for the wage years 1984 to 1986. See Appendix A for details.

reflect predicted and residual wage variation. Here, the predicted log wage is based on a standard human capital regression that relates individual log wages to a flexible specification in schooling, experience and sex. (See Appendix A.) The results show that the evolution of U.S.-Swedish differences in the industry mean of log wages predominantly reflects industry wage differentials that are accounted for by easily observed worker characteristics. However, Sweden's relative shift towards higher wage industries also reflects some movement toward industries with higher mean wages after conditioning on standard proxies for the human capital characteristics of workers.

Table 7 reports the weighted mean of within-industry wage dispersion in the two countries.[17] The table shows a steady march by the U.S. employment distribution towards industries with greater wage dispersion. In contrast, Sweden exhibits no clear pattern in this regard, although the index value rises somewhat over the sample period. As of 1970, the U.S. and Swedish industry distributions generate identical values of 54.36 percent for the wage dispersion index. Over the next 20 years, the difference between the U.S. and Swedish index values rises and eventually peaks in 1990 at about six-tenths of a percentage point. This is a small effect relative to the gap between U.S. and Swedish wage inequality that opened up after 1970. In terms of Figure 1, it accounts for roughly 5 percent of the U.S.-Swedish gap in the standard deviation of log hourly wages that opened up from 1968 to 1984.

As before, we use a standard wage regression to construct indexes based on predicted and residual log wages. From the regression estimates, we compute industry-level measures of the standard deviation of predicted and residual log wages. These measures serve as X variables in the index formula (4). The rightmost two columns in Table 7 report the results, and an interesting finding emerges: The Swedish index of dispersion in residual log wages falls continuously relative to the U.S. index from 1970 to 1990. (In contrast, the Swedish

[17]To calculate the Table 7 entries, we first compute the standard deviation of log hourly wages for each industry using 1984-1986 data on individual U.S. workers. We then construct wage dispersion indexes according to equation 4.

index of dispersion in predicted wages actually rises relative to the U.S. index after 1970.) In other words, the Swedish employment distribution undergoes a steady relative shift away from industries with high residual wage dispersion. Between 1970 and 1990, this shift involves a relative decline of more than one percentage point in Sweden's residual wage dispersion, which amounts to about 10 percent of the rise in the U.S.-Swedish inequality gap over the period.

This finding fits well with our story about the effects of Swedish wage-setting institutions on the industry distribution of employment. As we discussed in section 2.2, wage-setting institutions compress residual wage dispersion. Insofar as industry differences in residual wage dispersion reflect efficiency considerations, centralized wage-setting institutions reduce the relative productivity of industries with high efficient levels of residual wage dispersion. This effect of wage-setting institutions on relative productivity levels is likely to move industry employment shares in the same direction.[18]

But other forces may also be at work. Two forces that plausibly play an important role in this regard are the expansion of the Swedish welfare state and declines in explicit and implicit subsidies to the Swedish construction sector.[19] These developments can drive changes in the wage dispersion indexes, independently of any role for wage-setting institu-

[18]This prediction is not iron-tight without placing restrictions on product demand elasticities, factor substitution elasticities and the cross-industry correlations between these elasticities and the efficient level of residual wage dispersion. For example, if industry-level product demand is sufficiently inelastic, lower labor productivity leads to higher employment. If this response pattern predominates, a shift in relative industry productivities causes industry employment shares to move in the opposite direction.

[19]Subsidies to the construction sector take several forms: below-market interest rates for the renovation of existing buildings and for new residential construction, a preferred treatment of structures under credit market regulations, and a preferred treatment of housing relative to other forms of wealth accumulation by the individual income tax system. By virtue of these interventions, after-tax real interest rates of minus 8 percent on 30-50 year mortgages were not unusual in the 1970s and 1980s. Turner (1990, 1999) provides a detailed description of Swedish interest rate subsidies; Davis and Henrekson (1999) describe some of the pertinent credit market regulations and tax code provisions. It is clear from these descriptions that the overall magnitude of the subsidies declined after the 1980s.

tions per se, by shifting the distribution of employment towards industries with relatively high or low degrees of wage dispersion. In this regard, Construction ranks number 20 out of 61 industries in terms of the dispersion in residual log wages. Public Administration and Welfare Services rank 44th and 39th, respectively.[20] Thus, the declining share of employment in the Construction sector, and the rising shares in Public Administration and Welfare Services sectors contribute to a decline in Sweden's wage dispersion index.

The bottom panel in Table 7 reports results based on a subset of industries that excludes Construction, Public Administration and Welfare Services. Here, the most important message is that, even after excluding these industries, Sweden experienced a relative decline in the index of residual wage dispersion. The relative decline in the Swedish index of residual wage dispersion in the bottom panel is about 80 percent as large as in the top panel.

4 Wage Structure and the Industry Distribution

4.1 Hypotheses and Regression Specifications

We now consider multivariate regression models designed to quantify how the wage structure relates to U.S.-Swedish differences in the industry distribution of employment. In line with the discussion in section 2, we examine three empirical issues regarding these differences and their evolution over time: (i) the explanatory role of between-industry and within-industry aspects of wage dispersion, (ii) asymmetric responses to above-average and below-average levels of industry mean wages, and (iii) differential responses to predicted and residual components of wage dispersion.

Our earlier discussion points to a growing influence of centralized wage-setting institutions on the Swedish industry distribution from the 1960s through the early 1980s. That discussion also suggests a declining influence of wage-setting institutions on the Swedish industry distribution after 1983. These hypotheses about timing are necessarily imprecise,

[20] See Table A.2 in Appendix A.

because we have no obvious way to independently identify either expectations regarding future shifts in the wage structure or lags in the industry distribution response to shifts in the wage structure. Nonetheless, the timing hypotheses are precise enough to admit an evaluation in light of the empirical evidence produced below. One can also interpret the results as providing information about how quickly the industrial distribution of employment responds to changes in wage-setting institutions.

In addition to these timing hypotheses, our earlier discussion leads to four hypotheses about wage structure effects on the industry distribution:

H_1 : Relative to the U.S. distribution, the Swedish employment distribution tilts away from industries with below-average and above-average wage levels.

H_2 : The relative tilt in the Swedish industry distribution is more pronounced for industries with below-average than above-average wages.

H_3 : Relative to the U.S. distribution, the Swedish employment distribution tilts away from industries with high wage dispersion among workers.

H_4 : The tilt in the Swedish industry distribution is more sensitive to residual wage dispersion among workers than to wage dispersion generated by easily observed worker characteristics.

In line with our discussion about timing, we anticipate peak effects of the sort predicted by hypotheses 1-4 in the middle 1980s.

Table 8 reports regressions of U.S.-Swedish differences in industry-level employment shares on three wage structure variables. Panel A considers cross-sectional specifications in which the dependent variable equals the difference between the U.S. and Swedish log employment shares. Panel B considers specifications in which the dependent variable equals the time difference of the U.S.-Swedish difference in log employment shares.

The wage structure regressors in these specifications are defined as follows:

Shortfall = max{0, Aggregate Mean Log Wage - Industry Mean Log Wage}.

Excess = max{0, Industry Mean Log Wage - Aggregate Mean Log Wage}.

Within Dispersion = Standard Deviation in Mean Log Wages Among Workers in the Industry.

These three variables capture key aspects of the between-industry and within-industry wage structure in a simple manner. We compute these industry-level wage structure measures from U.S. Current Population Survey data on individual workers. Unless otherwise noted, we compute the wage variables from a pooled three-year sample of workers centered on 1985. Appendix A provides further details about the data.

4.2 Wage Structure Effects on the Industry Distribution

Section 2 characterizes Swedish wage-setting institutions as an increasingly powerful agent for wage compression from the 1960s until 1983. Given this characterizaton and allowing for response lags, we anticipate the largest effects of the wage structure variables on industry distribution outcomes in the middle 1980s. Hence, in evaluating the hypotheses about wage structure effects, we focus on cross-sectional regression results for 1985 and nearby years.

The results in Table 8 support hypotheses H_1, H_2 and H_3. In the 1985 cross-sectional regression, for example, all three wage structure variables enter with the predicted sign in a statistically significant manner. In line with H_2, the coefficient on Shortfall is roughly twice as large as the coefficient on Excess. The same pattern of results holds in the 1975, 1980, 1990 and 1994 cross-sectional regressions, but the Excess variable is statistically significant only in 1985 and 1990.

To assess the magnitude of these effects, consider the implied industry distribution response to a unit standard deviation change in each wage structure variable. To place the estimated responses in perspective, recall from Table 2 that the average absolute difference between the U.S. and Swedish industry employment shares equals .54 log points in the

1985 cross section. Multiplying the 1985 slope coefficients in Table 8 by the regressor standard deviations, we generate responses in the dependent variable of .225 for Excess, .583 for Shortfall and .230 for Within Dispersion.[21] These are large effects. Taking antilogs, they correspond to industry employment shares that are 25, 79 and 26 percent larger, respectively, in the United States than in Sweden.

The Table 8 regressions use time-invariant wage structure variables computed from a sample of U.S. workers centered on 1985. To investigate whether our results are sensitive to this choice, we reran the cross-sectional regressions using wage structure variables constructed from 1975, 1994 and time-varying contemporaneous data. The (unreported) results were highly similar to the Table 8 results. We conclude that our results do not depend on which year we choose to construct the U.S.-based wage structure measures. We also reran the cross-sectional and first-difference regressions on a subsample that excludes the Construction, Public Administration and Welfare industries, obtaining results highly similar to the ones reported in Table 8.

4.3 The Timing of Industry Distribution Responses

The empirical evidence in table 8 also supports the timing hypotheses that we articulated above. In this regard, note first that the results show no significant effect of wage structure variables on U.S.-Swedish differences in the industry distribution before 1970. This result shows up, for example, in the form of very low R^2 values in the 1960 and 1970 cross-sectional regressions and in the 1960-70 difference regression.

In striking contrast, after 1970 the wage structure variables explain a large fraction of U.S.-Swedish differences in the industry employment distribution and in the evolution of those differences over time. In the cross-sectional regressions, the adjusted R^2 rises from

[21]The regressor standard deviations are .1065 for Excess, .1432 for Shortfall and .0409 for Within Dispersion. As in the regression itself, we use the simple average of the U.S. and Swedish employment shares to calculate these weighted standard deviations. The corresponding statistics reported in Appendix Table A.1. differ slightly, because they are calculated using U.S. weights

zero in 1970 to a peak of .36 in 1985 and 1990. In the difference regressions, the wage structure variables account for about one-third of the evolution of U.S.-Swedish differences over the 1960-85, 1970-85 and 1970-90 intervals. The coefficients in the 1975-85 difference regression are nearly one-half as large as the corresponding coefficients in the 1985 cross-section. These results indicate that the wage compression achieved by Swedish wage-setting institutions caused large shifts in the Swedish industry distribution in the period from 1970 to 1985 or 1990.

Table 8 also provides clear evidence of a partial unwinding of these effects after 1985. In this regard, note that the coefficient signs switch in the 1985-90, 1985-94 and 1990-94 regressions relative to the other difference regressions. The 1985-94 regression has an adjusted R^2 value of .21. The cross-sectional regressions show a flat R^2 value from 1985 to 1990, but the coefficients on the between-industry wage structure variables begin to decline after 1985. These results support the view that the unraveling of centralized wage-setting arrangements strongly contributed to a reversal in the evolution of the Swedish industry distribution after 1985.

In summary, Table 8 indicates that wage structure effects explain about one-third of the relative industry employment shifts between the two countries from 1970 to 1985 and about one-fifth of the relative industry employment shifts during the reversal from 1985 to 1994. The timing of these wage structure effects on the industry distribution coincides with or somewhat lags the growing strength and subsequent demise of Sweden's centralized wage-setting institutions. We regard the broadly coincident timing of these developments as strong evidence in favor of our "institutional" interpretation of the estimated wage structure effects on the industry distribution and strong evidence against the view that these effects somehow reflect between-country differences in the skill mix of the workforce. Even if one concocts a plausible explanation for the cross-sectional relationship between the wage structure variables and U.S.-Swedish differences in the industry distribution, there is no evidence that the skill mix of the Swedish (or U.S.) workforce changed in the right direction or sufficiently rapidly to account for the estimated divergence from 1970 to 1985

and the subsequent reversal from 1985 to 1994. An interpretation of Table 8 based on differential relative demand shifts is also extremely strained. The omitted relative demand shifters would have to be correlated with the included wage structure regressors in just the right way to produce the effects predicted by H_1, H_2 and H_3 and to evolve over time in the right way to satisfy the timing hypotheses.

4.4 Predicted Versus Residual Wage Dispersion

Table 9 reports cross-sectional and first-difference regressions that distinguish between residual and predicted components of the wage structure. Recall that hypothesis H_4 pertains to the distinction between the Within-Industry Dispersion of residual and predicted wages, but we also consider the employment distribution responses to the Excess and Shortfall of predicted and residual mean industry wages.

Table 9 delivers a mixed verdict with respect to H_4. The coefficients on the Within Dispersion of residual wages have the predicted sign in the cross-section and first-difference regressions (except for the 1960-70 regression), and some are statistically significant or nearly so. However, they are typically smaller than the imprecisely estimated coefficients on the Within Dispersion of predicted wages, significantly so in the 1970 cross section, which violates H_4. For the 1960-85, 1970-85, 1970-90, 1975-85 and 1980-85 differencing intervals, there is a positive and sometimes statistically significant difference between the coefficients on residual and predicted Within Dispersion, as required by H_4. However, the coefficients on predicted Within Dispersion have the wrong sign and are again imprecisely estimated.

We also examined the industry distribution response to the Within Dispersion variables in other specifications. Cross-section and first-difference specifications that contain only the predicted and residual Within Dispersion variables tell essentially the same story as Table 7. Specifications that contain the Excess and Shortfall of predicted and residual wages plus the raw Within Dispersion variable tell essentially the same story as Table 8.

These results lead us to three conclusions: First, Sweden's relative employment distribution drifted towards industries with low residual wage dispersion between 1970 and 1990 (Table 7 and unreported results). Second, controlling for between-industry aspects of the wage structure, there is a clear-cut independent effect of Within Dispersion on the industry distribution of employment (Table 8 and unreported results). Third, controlling for between-industry aspects of the wage structure, the data do not precisely distinguish between the effects of residual and predicted Within Dispersion (Table 9 and unreported results).

The data speak somewhat more loudly about the employment distribution responses to between-industry aspects of the residual and predicted wage structure. Most notably, the cross-section results in Table 9 show much larger responses to the Shortfall in predicted wages than in residual wages. These differences are statistically significant at the 3 percent confidence level in every cross-sectional regression. A similar pattern holds with respect to the Excess predicted and residual log wages, but the Excess predicted wage effects are imprecisely estimated, and the differences between the predicted and residual effects are typically insignificant.

4.5 Explaining Movements in the Overall Distance

Figures 2 and 3 show the distance between U.S. and Swedish industry distributions according to two of the metrics considered earlier in Table 2. In Figure 2, the metric is the weighted standard deviation of between-country differences in the log industry employment shares. The weight on each industry-level observation equals the contemporaneous simple mean of the U.S. and Swedish employment shares, as in the regressions. This metric corresponds to the minimand underlying the weighted least squares estimation. In Figure 3, the metric is the weighted mean of absolute differences in the log employment shares.

The figures show the evolution of the distance metrics from 1960 to 1994 based on

actual data and based on fitted values from two regression specifications.[22] The "basic" specification contains Shortfall, Excess and Within Dispersion and is identical to the cross-sectional regressions reported in Panel A of Table 8. The "expanded" specification breaks out the predicted and residual components of Shortfall and Excess but, in line with the results in Table 9, does not decompose Within Dispersion.

The two figures tell similar stories. The "fitted" distance between the U.S. and Swedish industry distributions expands greatly from 1960 to 1985. This expansion is partly reversed from 1985 to 1994. From 1980 to 1994, the direction *and* magnitude of changes in the fitted distance are similar to those based on actual values, highly similar in Figure 2. Under our institutional interpretation of the regression results, this finding implies that wage-setting developments are essentially the whole story behind the sizable differential movements in the U.S. and Swedish industry distributions after 1980.

Prior to 1980, the "fitted" divergence is rapid, whereas the actual divergence is modest or nonexistent. This constrast implies that some unmeasured force counteracted the influence of wage-setting institutions and prevented the Swedish and U.S. distributions from rapidly diverging before 1975 or 1980. A natural conjecture is that worker skill distributions became more similar over time in the two countries, which would tend to bring the two industry distributions closer together. Alternatively, other aspects of factor endowments or technologies may have become more similar. An evaluation of these conjectures lies beyond the scope of this study.

5 Summary and Implications

Wage-setting institutions can exert a profound influence on the structure of relative wages, a claim that is well grounded in previous work. However, few previous studies trace out the consequences of institutional pressures on the wage structure for the allocation of

[22] We use the same degrees of freedom correction for metrics based on actual and fitted data, which slightly overstates model fit.

workers among industries. This study develops compelling evidence that these institutional pressures have important effects on factor allocations. The empirical results identify the rise and fall of centralized wage-setting arrangements in Sweden as a major factor in the evolution of its industry structure.

It is useful to recount the main elements of the story. Swedish wage differentials narrowed sharply after the middle 1960s, as centralized wage-setting arrangements spread throughout the economy. In the wake of this development, the U.S. and Swedish employment distributions diverged from the early 1970s until the middle or late 1980s. When the dissolution of Sweden's centralized wage-setting arrangements commenced in 1983, wage differentials began to expand almost immediately. By the late 1980s, the collapse of centralized wage setting was complete, and wage differentials continued to expand. The next several years saw a marked reversal in the evolution of Sweden's industry distribution as it lurched back toward the U.S. distribution. The empirical relationship between the U.S. wage structure and U.S.-Swedish differences in the industry distribution conforms to several hypotheses about the impact of Swedish wage-setting institutions. The timing and nature of the evolution in U.S.-Swedish differences during the sharp divergence and abrupt reversal also support these hypotheses.

The institutionally induced wage structure effects on the Swedish industry distribution are large in three respects. First, at their peak, they account for 40 percent of industry-by-industry differences in the U.S. and Swedish employment distributions.[23] Second, during the 1980-94 period of rapid divergence and partial reversal, the evolution in the fitted distance between the U.S. and Swedish distributions closely mirrors the evolution in the actual distance. Third, the estimated wage structure coefficients imply big effects on the industry distribution. As of 1985, the relative U.S. employment share is 25 percent larger for an industry with a mean wage one standard deviation above the aggregate mean wage,

[23]This statement is based on the fit of the cross-sectional regressions that underlie the "expanded" specification in Figures 2 and 3. The adjusted R-squared value for this specification is 37 percent in 1985 and 42 percent in 1990.

79 percent larger for an industry with a mean wage one standard deviation below the aggregate mean, and 26 percent larger when the within-industry wage dispersion exceeds its average value by one standard deviation.

We read these results as striking confirmation of the view encapsulated in the quotation at the paper's outset. We also read them as highly suggestive of an important role for wage-setting institutions in shaping the industry structure in other countries. In this regard, many European countries share important elements of the centralized arrangements that dominated the Swedish wage formation process until 1983 (Blau and Kahn, 1999). Wage setting became more decentralized in a few countries during the 1980s or 1990s (Katz, 1993) and more centralized in at least one country – Norway (Kahn, 1998). Like Sweden, Australia, Italy and Norway have experienced pronounced changes in the importance of centralized wage-setting instititutions in recent decades.[24] These countries, and perhaps others, provide fertile ground for further empirical study of how wage-setting institutions affect industry structure.

If wage-setting institutions play a major role in shaping national industry structures, they probably exert powerful effects on other aspects of factor allocation and business organization as well. In this regard, there are good reasons to suspect that the size distribution of employment is strongly influenced by wage-setting institutions. An extensive literature consistently finds higher wages at larger employers, even after exhaustive efforts to control for observable worker characteristics and other job attributes.[25] This well-established empirical regularity suggests that wage compression raises relative labor costs for smaller employers. The relationship between employer size and wage dispersion is much less explored, but a study of the U.S. manufacturing sector by Davis and Haltiwanger (1996) finds that both between-plant wage dispersion and overall wage dispersion decline with employer size. There is an especially pronounced negative relationship between employer

[24]See Erickson and Ichino (1995) on the Italian experience, Kahn (1998) on the Norweigian experience, and Gregory and Vella (1995) on the Australian experience.

[25]See Oi and Idson (1999) for a recent review.

size and wage dispersion after conditioning on standard human capital variables. This finding suggests that standard rate compensation policies of the sort that emerge from collective bargaining and centralized wage-setting arrangements are more inimical to the compensation structures preferred by smaller employers. Drawing on these and other observations, Davis and Henrekson (1999) compile several pieces of evidence that point to institutionally induced wage compression as an important factor that disadvantages smaller firms and establishments relative to their larger rivals.[26]

The evidence regarding the industry and size distribution of employment points to powerful effects of wage-setting institutions on factor allocation and the output mix. It seems likely that wage compression on the Swedish scale induces major distortions in the allocation of time between the home and market sectors and across activities within the market sector. Of course, many previous studies stress the egalitarian consequences of wage compression (e.g., Björklund and Freeman, 1997) and the deleterious effects on worker incentives to acquire schooling and other general forms of human capital (e.g., Edin and Topel, 1997). But wage compression can favorably affect employer incentives to invest in human capital (e.g., Acemoglu and Pischke, 1999) or to upgrade the productivity and quality of jobs (e.g., Davis, 1995). As these remarks indicate, the wage compression induced by centralized wage setting or collective bargaining can favorably and unfavorably affect welfare, investment and allocative efficiency along many dimensions. It seems fair to say that the net effects of wage compression on welfare and productive efficiency are open, and important, issues.

[26]There is also a body of evidence on how centralized wage-setting arrangements influence the relative quantities supplied of different demographic and skill groups. See Blau and Kahn (1999) for a review of work on this topic.

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Appendix A: Data Sources

Swedish Data on Employment by Industry

The Swedish employment-by-industry data cover all employment in the public and private sectors. The data for 1970 and 1994 are based on the Swedish Labor Force Survey (AKU), a monthly household survey covering about 10,000 individuals. The data for other years are based on the the *Folk- och Bostadsräkning* (FOB), a comprehensive household census of all Swedish residents. Our data from both sources are based on special tabulations performed by Statistics Sweden for the authors. Swedish employment data are unavailable for DH codes 9510 and 8329.2 in 1960.

U.S. Data on Employment by Industry

Our main sources for U.S. data on private-sector employment by industry are (i) the March figures in *Employment and Earnings* (Table B.12 for the 1994 data and Table B.2 for earlier years) and (ii) the March figures in *County Business Patterns* (CBP). These sources are based on establishment-level surveys or administrative records. The *Employment and Earnings* (EE) data have broader industry coverage (with a few exceptions), but the CBP data often provide greater industry detail. The CBP and EE data exclude self-employed persons, agricultural production workers, domestic workers, military personnel and employees of the Central Intelligence Agency and the National Security Agency. While EE covers most public sector employment in recent years, the data are too highly aggregated for our purposes.

We supplemented the EE data for Agricultural Services (SIC 07) with Current Population Survey (CPS) data on "farm operators and managers" and "farm workers", as reported in Table 649 of the 1995 *Statistical Abstract of the United States* for 1994 and comparable tables in earlier years. We obtained "Private Household" employment from CPS data, as reported in Table 649 in the 1995 *Statistical Abstract of the United States* and comparable tables in earlier years.

We drew upon *Bureau of Labor Statistics Bulletin 2307* (Table B-12) to add self-employed persons in the following industry groups: Forestry and Fishing, Mining, Construction, Wholesale Trade, Retail Trade, Health Services, Education, Entertainment and Recreation, FIRE, Personal Services (excluding domestic household), and Business Services and Repair. These data are tabulated from the Current Population Survey (CPS), a household survey, and cover the period from 1975 to 1985. We extended these data forward and backward in time and, in many cases, to a finer level of industry detail by using ratios of self-employment to other private sector employment within the same industry group. Details are available upon request.

Our main source for data on employment by industry in the public sector is *Public Employment* (PE). We allocated government employment to particular industries as indicated in the notes to our U.S.-Swedish concordance (See Appendix B.) We relied upon *Occupations of Federal White-Collar and Blue-Collar Workers* to obtain federal government employment of scientists, engineers and architects. We obtained employment figures for the U.S. Department of Defense from Table 551 in the 1995 *Statistical Abstract of the United States,* entries labelled "DoD Military and Civilian Employment", and comparable tables for earlier years.

U.S. employment data are unavailable for DH code 8323 in 1960 and 1970.

U.S. Data on Education and the Distribution of Wages by Industry

We constructed these data from individual records in the Annual Demographic Files of the March Current Population Survey. Our samples contain workers 18-64 years of age and exclude students, persons in the military and persons with an hourly wage less than 75 percent of the federal minimum wage. We also excluded primarily self-employed persons in the calculation of wage statistics. Hourly wages equal annual earnings divided by annual hours worked. We handled top-coded earnings observations in the same manner as Katz and Murphy (1992). We constructed time-consistent measures of educational attainment following Jaeger (1997). We pooled over two or three years to obtain larger samples. For

example, the "1985" industry-level statistics are computed from individual data from wage years 1984-1986.

We computed all simple and regression-based statistics on an hours-weighted basis. To generate predicted and residual wage observations, we regressed log real hourly wages on sex, years of schooling, four schooling class variables, years of schooling interacted with the schooling class variables, and a quartic in experience interacted with the other regressors. We also included year-specific intercepts.

Appendix B: Industry Categories and U.S.-Swedish Concordance

DH Code	Description	Swedish SIC[1]	U.S. SIC[2]
1100	Agriculture[3]	11	01, 02, 07
1200	Forestry and Logging	12	08, 241
1300	Fishing and Hunting[3]	13	09
2000	Mining	20	10, 12, 13, 14
3100	Manuf. of Food, Beverages, Tobacco	31	20, 21
3200	Manuf. of Textiles, Apparel, Leather	32	22, 23, 31
3300	Lumber, Wood Products and Furniture	33	24 (ex. 241), 25
3410	Manuf. of Pulp and Paper Products	341	26
3420	Printing and Publishing	342	27
3500	Chemicals and Chemical, Petroleum, Coal, Rubber and Plastic Products	35	28, 29, 30
3600	Stone, Clay and Glass Products	36	32
3700	Basic (Primary) Metal Industries	37	33
3810	Fabricated Metals, except Machinery and Equipment	381	34
3820	Manuf. of Nonelectrical Machinery	382	35
3830	Manuf. of Electrical Machinery	383	36
3840	Manuf. of Transportation Equipment[4]	384	37 (incl. government 3731)
3850	Manufacture of Professional and Scientific Instruments	385	38
3900	Miscellaneous Manufacturing Industries	39	39
4100	Electricity, Gas, Steam and Water Works[5]	41, 42, 7115	46, 49 (ex. 495) + public sector
5000	Construction	50	15, 16, 17
6100	Wholesale Trade	61	50, 51
6200	Retail Trade	62	52, 53, 54, 55, 56, 57, 59 + State Liquor Stores
6310	Eating and Drinking Establishments	631	58
6320	Hotels and Other Lodging	632	70
7111	Railway Transport	7111	40, 474
7112	Local and Interurban Passenger Transport[6]	7112,7113	41, 4725 + public sector
7114	Freight Transport by Road[7,8]	7114, 719	42, 472 (ex. 4725), 473, 478 + public sector
7116.1	Parking Services	71161	752
7116.9	Vehicle Rental Services[9]	71169	751
7120	Water Transport	712	44 + public sector
7130	Air Transport	713	45 + public sector
7201	Postal Services[10]	72001	43 (U.S. Postal Service)
7202	Telecommunications	72002	48
8100	Financial institutions	81	60, 61, 62, 67

8200	Insurance	82	63, 64
8310	Real Estate[11]	831	65, 7349
8321	Legal Services	8321	81 + federal government
8322	Accounting and Auditing	8322	872
8323	Computer and Data Processing Services[12]	8323	737 (ex. 7377)
8324	Engineering, Architectural and Technical Services	8324	871 + federal government 7336
8325	Advertising Services	8325	731, 7331
8329.1	Typing, Duplicating, Copying Services	83291	7334, 7338
8329.2	Business Management and Consulting Services	83292	874
8329.9	Business Services nec[13,14,15]	83299	732, 736, 7383, 7389, 89
8330	Business Machinery and Equipment Rental and Leasing	833	735, 7377
9101	Public Administration[16]	9101	See Note.
9102	National Defense	9102	DoD (Civilian + Military)
9103	Police and Security Services	9103, 83293	7381, 7382 + public sector
9104	Fire Protection	9104	Local government
9200	Sanitary Services[11]	92	495, 7342 + public sector
9310	Education Services[17,18]	931	82 (ex. 823), 833 + public sector
9320	Research and Scientific Institutes[19]	932	873 + federal government
9330	Medical, Dental, Health Services	933	80 (including government workers in 806)
9340	Welfare Services[20]	934	83 (ex. 833) + public sector
9350	Business, Professional and Labor Associations	935	861, 862, 863
9390	Religious, Political, Social and International Organizations	939, 96	864, 865, 866, 869
9400	Recreational and Cultural Services[21]	94	78, 79, 823, 84 + public sector
9510	Repair Services nec	951	753, 754, 76
9520	Laundries and Cleaning Services	952	721
9530	Private Household Workers[22]	953	88
9590	Other Personal Services[23]	959	72 (ex. 721), 7335, 7384

Notes:

1. The 1969 SNI code.
2. The 1987 U.S. Standard Industrial Classification code. There were important changes in the classification of some industry groups during our sample period. Additional notes and computer programs related to our treatment of these changes are available upon request.

3. The Swedish data on Hunting are included in Agriculture (DH code 1300).
4. The U.S. data include federal government employees engaged in Ship Building and Repairing (SIC 3731), as repoted in *Employment and Earnings.*
5. Includes pipeline transport of petroleum and natural gas.
6. U.S. employment in this category includes local government transit workers and a portion of government workers engaged in the maintenance and operation of streets, bridges and highways.
7. U.S. employment in this category includes a portion of government workers engaged in the maintenance and operation of streets, bridges and highways.
8. The Swedish and U.S. data include some passenger transport services, principally travel agencies.
9. The Swedish data include miscellaneous supporting services to land transport such as vehicle breakdown service and traffic pilot service.
10. Private mail and courier services are included in DH codes 7114 and 7130.
11. In Sweden, some workers performing activities encompassed by U.S. SIC 7349 are classified under SNIs 92003 (Chimney Sweeping) and 93004 (Char and Similar Cleaning Work). This classification difference may cause us to slightly overstate (understate) relative U.S. employment in Real Estate (Sanitary Services). (U.S. SIC 7349 (Building Services, nec) accounts for about one-third of total U.S. employment in DH code 8310.)
12. This category is not separately reported in U.S. data in 1970 and earlier years.
13. DH Code 8329.9 (Business Services n.e.c.) includes personnel supply services, credit reporting and collection agencies, tax return assistance agencies, and news syndicates.
14. U.S. SIC 736 (Personnel Supply Services) encompasses temporary employees, employee leasing firms and employment agencies. This category accounts for slightly less than one-third of employment in DH code 8329.9 from 1960 to 1970, 41% in 1975, 50% in 1980 and 63% in 1994. Segal and Sullivan (1997) report that temporary employees account for about 90% of employment in Personnel Supply Services in 1995, and that the share of temporary employees has remained fairly stable in the period from 1972 to 1996. In Sweden, SNI 83299 includes the furnishing of services on a fee or contract basis by employment agencies, but Sweden has no counterpart to employee leasing firms. In addition, temporary employees supplied by employment agencies are much rarer in Sweden than in the United States.
15. The activities listed for U.S. SIC 89 in the 1987 *Standard Industrial Classification Manual* are a mixture of business services and personal services, but most of the listed activities are more strongly directed to business services. In any case, the employment figures reported in EE for SIC 89 are quite small, amounting to less than 40,000 in March 1994.
16. We calculated U.S. employment in Public Administration as a residual as follows. First, we obtained nondefense government employment, as reported in PE. Second, we subtracted government employment, as reported in PE, in the following categories: Natural Resource Management, Manufacturing, Streets and Highways, Local Government Transit, Water Transport, Air Transport, Sanitation and Sewerage, Utilities, Postal Service, Health Services, Provision of Legal Services (Federal), Education, Li-

braries, Public Welfare, Administration of Social Insurance Programs, Housing and Community Development, Parks and Recreation, Police and Guards, Fire Protection, State Liquor Stores, and the Space Program. Third, we further subtracted federal governemnt employment of research scientists, engineers and architects, as reported in *Occupations of Federal White-Collar and Blue-Collar Workers.*

17. Child care and pre-school services are included in DH code 9340.
18. U.S. employment in Job Training and Related Services (SIC 833) is not separately identified in 1970 and earlier years. In these earlier years, some job tranining activities are classified under Education (SIC 82, DH code 9310), but others are classified under Health Services (SIC 80, DH code 9330) or Charitable Organizations (DH code 9340).
19. The U.S. data include federal government scientists in the "Biological Sciences" and the "Physical Sciences", as reported in *Occupations of Federal White-Collar and Blue-Collar Workers.*
20. This category includes care of children outside the home (and not in elementary and secondary schools), care of the elderly, care of alcoholics and drug addicts, legal aid offices, other charitable work carried out by organizations like the Red Cross, and the administration of public welfare programs and social insurance programs. U.S. public sector employment consists of three categories in *Pulic Employment:* Public Welfare, Social Insurance Administration, and Housing and Community Development.
21. U.S. employment includes government workers in Parks and Recreation.
22. Includes care of children in the home; care of children outside the home is included in Welfare Services (DH code 9340).
23. Includes commercial photography in Sweden (SIC 9592) and the United States (SIC 7335). Other activities in this category include photographic labs and portrait studios, beauty and barber shops, shoe repair shops, and funeral services. Our measure of U.S. employment growth in this category from 1970 to 1975 and from 1985 to 1990 is affected by certain changes in the set of activities classified under U.S. SIC 72 (and between 721 and the rest of 72). These changes occurred as part of the 1972 and 1987 revisions to the U.S. SIC system. Whether these classification changes have a substantial effect on measured U.S. employment growth in this category is uncertain.

Notes to Figures

Figure 1:

Sources: (a) Swedish data on the standard deviation of log hourly wages, 1968-1988, were supplied by Per Anders Edin. The data for 1968, 1974 and 1981 are constructed from the Level of Living Survey (LNU), and the data for 1984, 1986 and 1988 are constructed from the Household Market and Nonmarket Activities Survey (HUS). (b) Swedish data on the standard deviation of log hourly wages for private-sector blue-collar workers, 1970-1990, are from Figure 6 in Hibbs and Locking (1996). (c) Swedish data on the 90-10 log earnings differential for full-time, full-year workers, 1975-1996, are from Statistics Sweden/HINK, as reported in Johansson, Lundborg and Zetterberg (1999). (d) U.S. data on the hours-weighted standard deviation of log hourly wages, 1963-1994, were constructed by the authors from the Annual Demographic Files of the March Current Population Survey. The CPS sample contains wage and salary workers who are between 18 and 64 years old. It excludes military personnel, students, persons with an hourly wage less than 75 percent of the federal minimum wage, and persons for whom self employment was the primary source of earnings.

Figures 2 and 3:

Source: Constructed by the authors as described in the text.

Figure 1. U.S and Swedish Earnings Inequality, 1963 – 1996

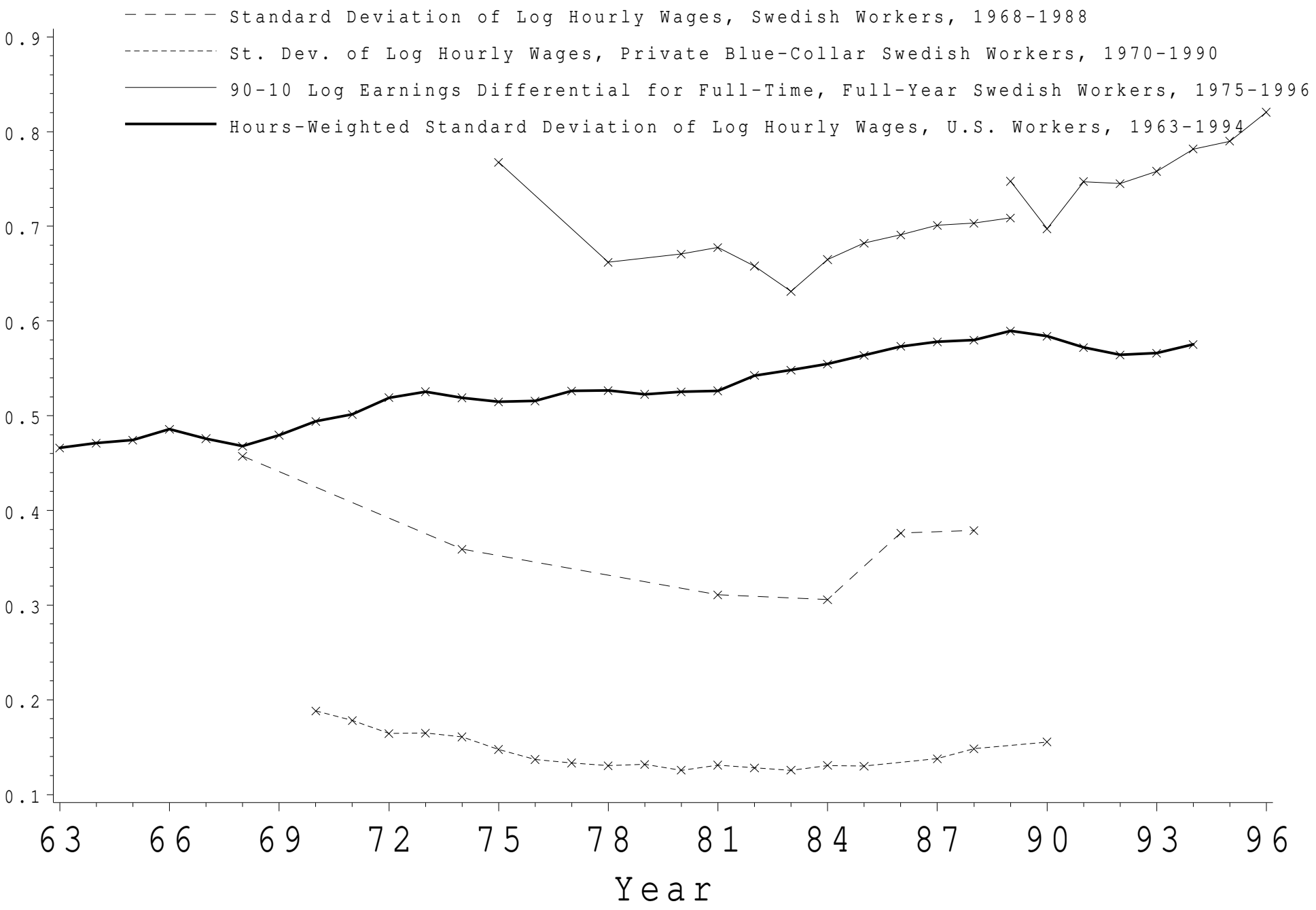
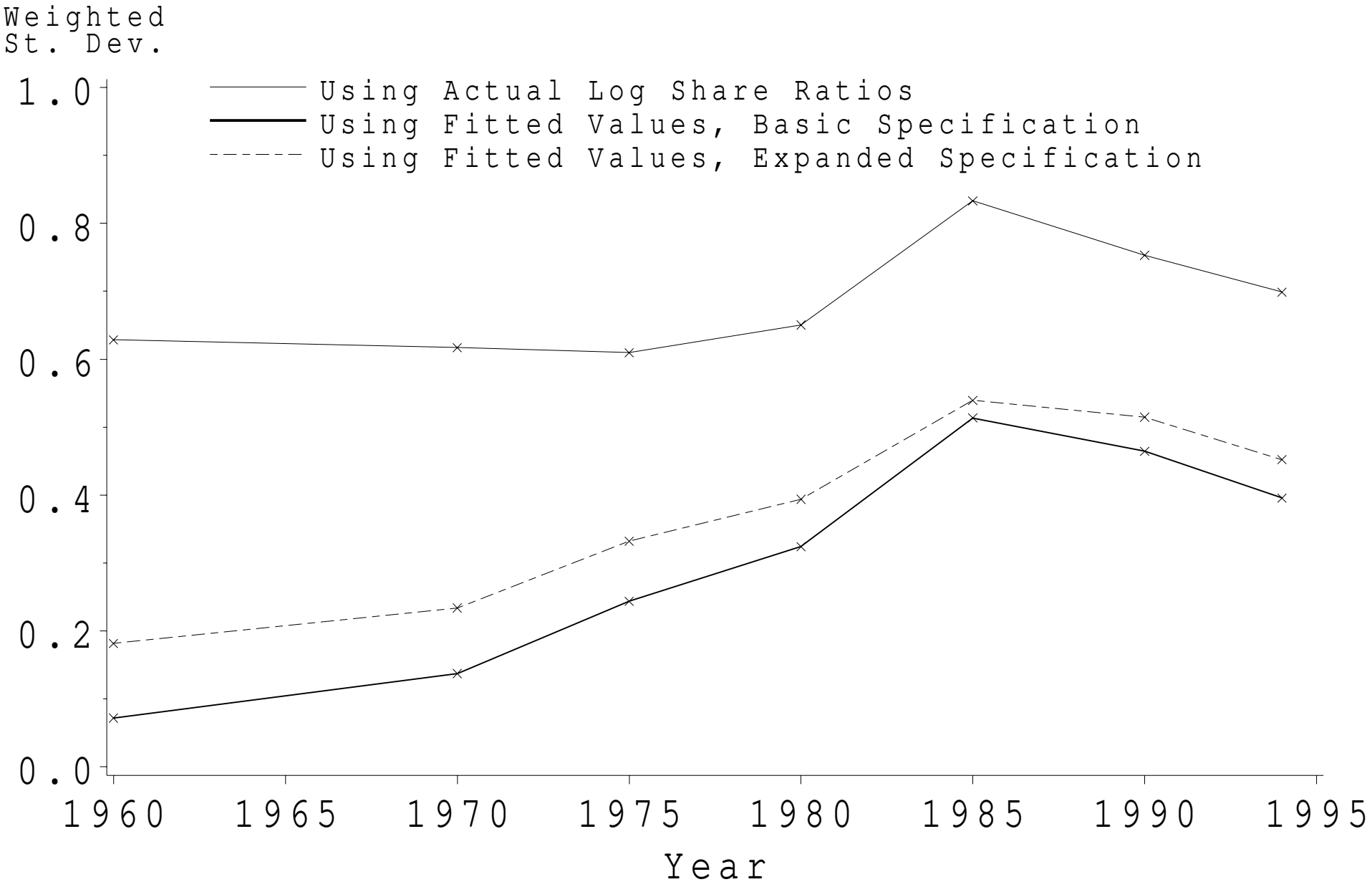
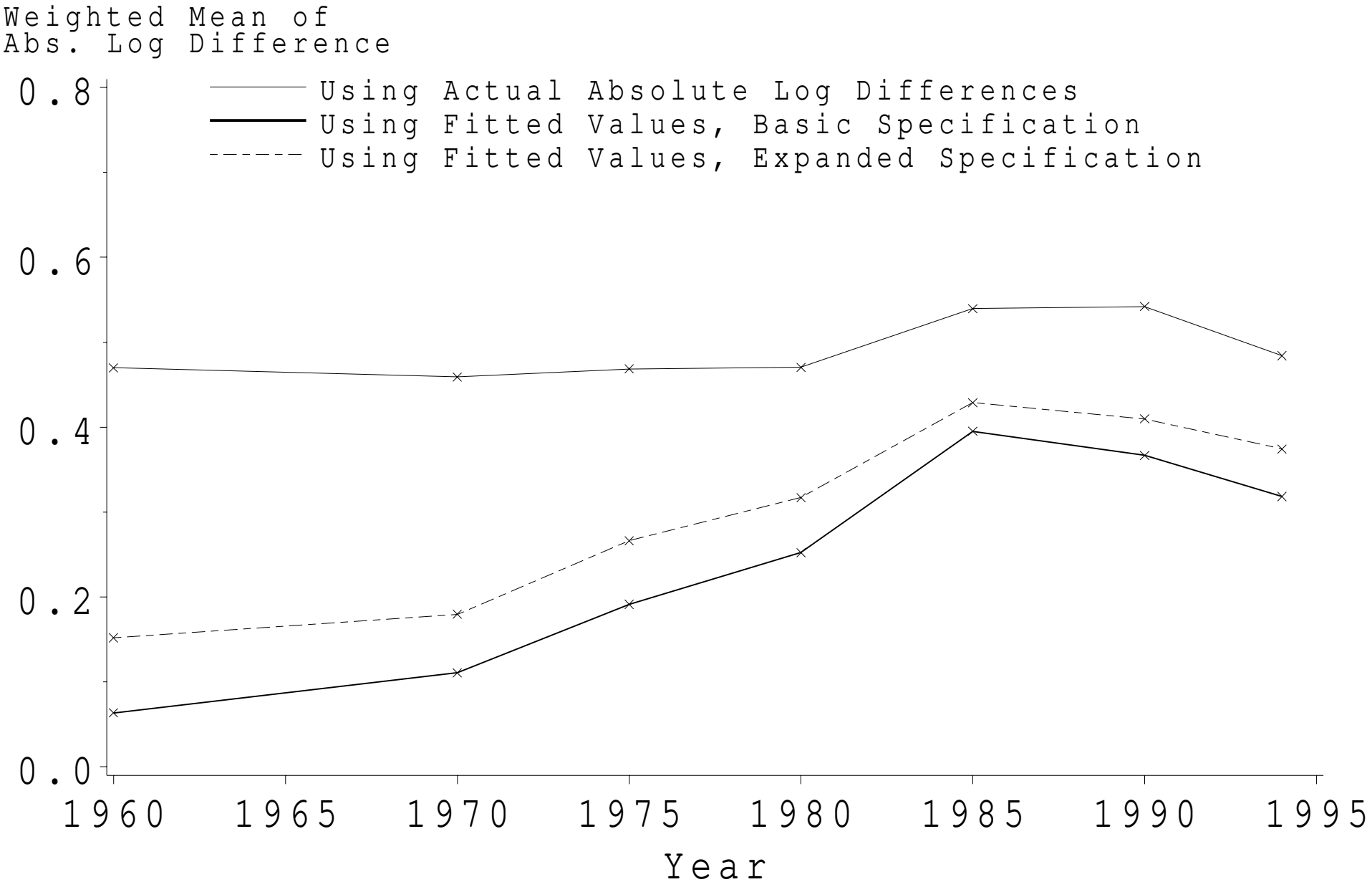


Figure 2. The Distance between U.S and Swedish Distributions of Employment by Industry, 1960–1994



For the basic specification, see Panel A of Table 8. The expanded specification distinguishes between predicted and residual components of between-industry wage differentials.

Figure 3. The Distance between U.S and Swedish Distributions of Employment by Industry, 1960–1994



For the basic specification, see Panel A of Table 8. The expanded specification distinguishes between predicted and residual components of between-industry wage differentials.

Table 1: Hourly Wage Dispersion Among Male Workers in Fifteen Countries

Country	*Year*	*P90/P10*	*P10/P50*
Sweden	1988	2.05	.76
Italy	1987	2.08	.75
Norway	1987	2.16	.69
Denmark	1990	2.18	.73
Australia	1990	2.23	.70
Belgium	1990	2.25	.73
Netherlands	1990	2.25	.73
Germany	1990	2.29	.71
Portugal	1989	2.63	.71
Austria	1990	2.75	.60
Japan	1990	2.84	.61
United Kingdom	1990	3.21	.61
France	1990	3.41	.63
Canada	1990	3.95	.44
United States	1989	5.63	.38

Source: OECD (1993, Table 5.2) as reported in Björklund and Freeman (1997, Figure 1.2).

Note: The third column reports the ratio of the 90th percentile wage to the 10th percentile wage, and the fourth column reports the ratio of the 10th percentile wage to the 50th percentile wage. See Björklund and Freeman for additional notes.

Table 2. Measures of Distance Between the U.S. and Swedish Distributions of Employment by Industry, 1960-1994

Year	Weighted Mean of Absolute Log Differences (times 100)	Sum of Absolute Share Differences (times 100)	Standard Deviation of Log Employment Share Differences (times 100)
1960	47.0	43.7	62.8
1965	.	.	.
1970	45.9	42.8	61.7
1975	46.9	43.9	61.0
1980	47.0	43.3	65.0
1985	54.0	47.5	83.3
1990	54.2	49.1	75.3
1994	48.4	44.0	69.9

Notes:
(1) Based on a 61-industry concordance constructed by the authors and described in Appendix B.
(2) In calculating the mean absolute difference in log employment shares and the standard deviation of the log employment share differences, each industry observation is weighted by the simple average of its employment share in the two countries.

Table 3. Intensity of Change in the Industry Distribution of Employment Sweden and the United States, 1960 to 1994

Expressed as Five-Year Rates of Change

Time Interval	Weighted Mean of Absolute Log Employment Changes		Sum of Absolute Employment Share Changes		Weighted Standard Deviation of Log Employment Share Changes	
	Sweden	United States	Sweden	United States	Sweden	United States
1960-65	16.7	12.6	24.2	15.6	19.8	13.1
1965-70	16.7	19.0	24.2	18.3	19.8	16.0
1970-75	17.1	13.8	27.5	21.4	24.5	16.1
1975-80	13.1	17.4	22.2	16.5	17.5	12.7
1980-85	11.8	10.8	19.1	13.9	18.2	12.9
1985-90	12.4	14.7	17.0	15.1	14.4	12.7
1990-94	20.8	8.6	26.0	14.2	22.1	11.7
Cumulative	108.6	96.9	160.2	114.9	136.3	95.2

Notes:
(1) Based on a 61-industry concordance constructed by the authors and described in Appendix B.
(2) In calculating the weighted statistics, each industry observation is weigthed by the simple average of own-country employment in the initial and terminal years of the time interval.
(3) Since we lack 1965 data for Sweden, the 1960-65 and 1965-70 rates of change for Sweden are calculated as half the 1960-70 change.

Table 4. Employment Share Differences by Major Industry Group, Sweden and the United States, 1960 to 1994

U.S. Employment Share Minus Swedish Employment Share

Year	Trade	Lodging and Dining	Personal Services	Business Services	FIRE	Defense and Security
1960	4.6	1.7	2.1	0.9	2.4	3.7
1965	.	.	.	.	.	.
1970	3.6	2.3	2.0	1.3	2.2	3.3
1975	4.1	3.5	1.8	0.9	2.4	2.5
1980	4.5	4.5	2.0	1.1	2.0	1.8
1985	5.2	4.7	2.8	2.3	2.4	2.0
1990	5.0	4.8	2.1	1.8	2.6	1.7
1994	3.9	4.9	2.3	2.6	2.1	1.5

Year	Manufacturing	Construction	Transportation	Public Admin. Welfare, Health and Education	All Other
1960	-9.1	-4.9	0.0	2.3	-3.8
1965	.	.	.	.	.
1970	-4.3	-5.0	-1.1	-1.3	-3.0
1975	-6.6	-2.9	-0.9	-2.9	-2.0
1980	-3.5	-1.7	-1.0	-7.2	-2.6
1985	-4.8	-1.3	-1.2	-9.9	-2.0
1990	-5.2	-1.9	-0.8	-8.4	-1.8
1994	-4.4	-0.9	-0.9	-8.7	-2.5

Notes:
(1) Appendix A describes the sources for the employment data.
(2) Appendix B describes the detailed industry concordance that underlies the major industry groups. Personal Services contains DH codes 9510-9590, Business Services contains DH codes 8321-8330, Defense and Security contains 9101-9102, FIRE contains 8100-8310, Public Administration, Health, Education and Welfare Services conatins 9101 and 9310-9340.

Table 5. Weighted Mean Years of Schooling in the United States and Sweden

Weights: Own-Country Contemporaneous Industry Employment Shares
Schooling Measure: Years of Schooling Among U.S. Workers in 1984-86

	All Industries			Excluding Public Administration and Welfare Services		
Year	United States	Sweden	Difference	United States	Sweden	Difference
1960	12.66	12.45	0.20	12.61	12.41	0.21
1965	12.75	.	.	12.71	.	.
1970	12.89	12.75	0.14	12.86	12.65	0.20
1975	12.99	12.92	0.07	12.95	12.80	0.14
1980	13.01	13.04	-0.04	12.96	12.92	0.05
1985	13.06	13.13	-0.08	13.02	12.99	0.03
1990	13.12	13.15	-0.03	13.08	13.00	0.08
1994	13.16	13.24	-0.09	13.11	13.09	0.02

Notes:
(1) Appendix A describes the sources for the employment data.
(2) Appendix B describes the industry categories and the U.S.-Swedish concordance.

Table 6. Weigthed Mean of Industry Wages in the United States and Sweden

Weights: Contemporaneous Industry Employment Shares
Wage Measure: Industry Mean Log Wage Among U.S. Workers in 1984-86

Year	United States	Sweden	Difference X 100	Difference in Predicted Wages X 100	Difference in Residual Wages X 100
1960	1.99	2.01	-1.51	-0.83	-0.80
1965	2.00	.	.	.	.
1970	2.01	2.03	-1.85	-1.19	-0.87
1975	2.01	2.05	-3.96	-2.21	-1.87
1980	2.01	2.05	-3.92	-2.64	-1.38
1985	2.01	2.06	-5.52	-3.44	-2.25
1990	2.01	2.06	-5.10	-3.25	-2.18
1994	2.00	2.05	-4.89	-3.29	-1.93

Notes:
(1) The predicted and residual log wage measures are based on an hours-weighted least squares regression of the log hourly wage on dummy variables for year,

sex and four educational attantment categories, years of schooling interacted with the four schooling categories and a quartic polynomial in experience fully interacted with the other variables (except year).
Also, see notes to Table 5.

Table 7. Mean Within-Industry Wage Dispersion in the United States and Sweden

Weights: Own Contemporaneous Industry Employment Shares
Dispersion Measure: Within-Industry Standard Deviation of Log Wages

Year	United States X 100	Sweden x 100	Difference X 100	Difference, St. Dev. of Predicted Wages	Difference, St. Dev. of Residual Wages
1960	54.06	53.98	0.08	0.21	-0.13
1965	54.20	.	.	.	.
1970	54.36	54.36	0.00	0.25	-0.20
1975	54.52	54.42	0.10	0.08	0.22
1980	54.63	54.54	0.09	-0.05	0.25
1985	54.86	54.48	0.38	-0.03	0.79
1990	55.09	54.52	0.58	0.07	0.83
1994	55.26	54.71	0.55	-0.07	0.80

Excluding Construction, Public Administration and Welfare Services

Year	United States X 100	Sweden x 100	Difference X 100	Difference, St. Dev. of Predicted Wages	Difference, St. Dev. of Residual Wages
1960	53.86	53.59	0.27	0.10	0.11
1965	53.99	.	.	.	.
1970	54.19	54.05	0.14	0.23	-0.03
1975	54.37	54.22	0.15	0.15	0.28
1980	54.48	54.44	0.04	0.05	0.19
1985	54.74	54.40	0.34	0.14	0.74
1990	55.00	54.47	0.53	0.23	0.79
1994	55.20	54.78	0.42	0.10	0.64

See the notes to Tables 5 and 6.

Table 8. Industry-Level Regressions on Wage Structure Variables by Year

A. Cross-Sectional Regressions by Year
Dependent Variable: log(U.S. Employment Share/Swedish Employment Share)

Year	Excess over Agg. Log Wage	Standard Error	Shortfall from Agg. Log Wage	Standard Error	Within-Industry St. Dev. of Log Wage	Standard Error	Standard Error of Residual	Adjusted R-squared	Test: Excess = Shortfall
1960	0.09	0.98	0.41	0.56	0.16	2.48	0.850	-0.042	.69
1970	0.77	0.90	0.98	0.58	0.62	2.22	0.804	-0.004	.80
1975	0.63	0.82	1.79*	0.57	1.72	2.03	0.740	0.121	.12
1980	1.48	0.83	2.54*	0.59	2.64	2.01	0.747	0.219	.17
1985	2.11*	0.95	4.07*	0.70	5.62*	2.29	0.869	0.364	.03
1990	1.90*	0.86	3.63*	0.64	6.35*	2.02	0.785	0.364	.04
1994	1.17	0.83	3.03*	0.61	4.94*	1.93	0.763	0.291	.02

B. First-Difference Regressions
Dependent Variable: Change in log(U.S. Employment Share/Swedish Employment Share)

Interval	Excess over Agg. Log Wage	Standard Error	Shortfall from Agg. Log Wage	Standard Error	Within-Industry St. Dev. of Log Wage	Standard Error	Standard Error of Residual	Adjusted R-squared	Test: Excess = Shortfall
1960-70	0.25	0.38	0.25	0.22	-1.60	0.95	0.329	0.044	1.00
1960-85	1.55	1.11	3.72*	0.69	1.98	2.77	0.981	0.348	.03
1970-85	0.84	0.87	3.02*	0.59	3.00	2.11	0.781	0.324	.01
1970-90	0.51	0.69	2.38*	0.47	3.31*	1.66	0.619	0.321	.00
1975-85	0.98	0.59	1.92*	0.42	2.46	1.45	0.539	0.256	.09
1975-90	0.68	0.44	1.39*	0.31	2.82*	1.05	0.397	0.264	.08
1980-85	0.34	0.42	1.15*	0.30	2.13*	1.01	0.379	0.228	.04
1980-90	0.05	0.32	0.68*	0.23	2.44*	0.76	0.288	0.231	.04
1985-90	-0.30	0.22	-0.39*	0.16	0.26	0.52	0.200	0.098	.64
1985-94	-0.99*	0.34	-0.96*	0.25	-1.17	0.82	0.317	0.207	.94
1990-94	-0.66*	0.26	-0.53*	0.19	-1.41*	0.60	0.235	0.128	.59

Notes:
(1) All regressions include an intercept.
(2) Each regression contains 61 observations except as follows: samples that include 1970 (1960) data contain only 60 (58) observations.
(3) All regressions are estimated by weighted least squares with the weight for each observation set to the simple average of U.S. and Swedish employment shares in the indicated year or interval.
(4) The wage structure regressors are computed from U.S. Current Population Survey data in 1984-86.
(5) An asterisk denotes a coefficient that differs from zero at the 95percent confidence level.
(6) The rightmost column reports the marginal significance level in an F-test of the null hypothesis that the coefficients on Excess and Shortfall are equal.

Table 9. Industry-Level Regressions on Wage Structure Variables by Year, Predicted and Residual Components

A. Cross-Sectional Regressions by Year

Dependent Variable: log(U.S. Employment Share/Swedish Employment Share)

Year	Excess Predicted Wage	S.E.	Excess Residual Wage	S.E.	Shortfall in Predicted Wage	S.E.	Shortfall in Residual Wage	S.E.	W/I SD of Predicted Wages	S.E.	W/I SD of Residual Wages	S.E.	Adjusted R-squared
1960	6.50	3.64	-0.15	1.58	3.95*	1.58	-2.73	1.67	6.27	3.73	1.12	2.21	0.029
1970	5.99	3.16	0.95	1.43	4.56*	1.35	-1.90	1.48	7.49*	3.25	-0.37	1.94	0.130
1975	6.79*	2.90	0.51	1.30	5.21*	1.24	-1.53	1.37	4.76	3.02	0.76	1.81	0.238
1980	6.17*	2.95	1.42	1.34	6.10*	1.23	-1.81	1.35	3.98	3.11	1.19	1.83	0.308
1985	7.45*	3.60	1.83	1.65	7.32*	1.49	-1.74	1.68	3.63	3.77	4.22	2.28	0.369
1990	7.43*	3.17	1.58	1.52	6.90*	1.28	-1.95	1.46	5.10	3.35	4.25*	2.02	0.400
1994	6.48*	3.02	0.44	1.46	6.27*	1.23	-2.22	1.37	3.46	3.21	3.13	1.90	0.345

B. First-Difference Regressions

Dependent Variable: Change in log(U.S. Employment Share/Swedish Employment Share)

Interval	Excess Predicted Wage	S.E.	Excess Residual Wage	S.E.	Shortfall in Predicted Wage	S.E.	Shortfall in Residual Wage	S.E.	W/I SD of Predicted Wages	S.E.	W/I SD of Residual Wages	S.E.	Adjusted R-squared
1960-70	-1.27	1.34	1.43*	0.59	0.89	0.58	0.55	0.62	0.58	1.39	-1.85	0.82	0.145
1960-85	1.42	4.22	1.64	1.89	5.10*	1.79	0.31	1.94	-6.53	4.39	2.04	2.63	0.329
1970-85	1.19	3.35	0.36	1.54	3.28*	1.41	0.14	1.56	-5.62	3.48	3.32	2.09	0.280
1970-90	0.80	2.67	0.26	1.25	2.69*	1.11	0.05	1.24	-3.58	2.78	2.98	1.67	0.265
1975-85	0.38	2.37	0.82	1.08	2.06*	1.00	-0.18	1.11	-2.16	2.47	2.42	1.49	0.175
1975-90	0.14	1.76	0.66	0.82	1.59*	0.73	-0.28	0.82	-0.50	1.84	2.19	1.11	0.161
1980-85	1.16	1.64	0.12	0.75	1.07	0.68	0.04	0.76	-0.67	1.72	2.33*	1.03	0.163
1980-90	0.97	1.25	-0.05	0.58	0.69	0.51	-0.08	0.57	0.82	1.32	2.07*	0.78	0.155
1985-90	-0.24	0.86	-0.19	0.40	-0.31	0.35	-0.03	0.40	1.20	0.91	-0.31	0.55	0.026
1985-94	-1.65	1.36	-1.13	0.64	-1.01	0.56	-0.25	0.63	-0.52	1.44	-1.30	0.86	0.121
1990-94	-1.28	0.95	-0.95*	0.46	-0.67	0.38	-0.20	0.43	-1.91	1.00	-0.93	0.60	0.142

See notes 1-5 to Table 8.

Table A.1. Summary Statistics for Measures of Industry Characteristics

Weighted by 1985 U.S. Industry Employment Shares

Variable	Mean	St. Dev.
Years of Schooling	13.05	1.15
Mean Hourly Wage (1982 $)	8.88	1.90
Mean Log Hourly Wage	2.01	0.23
Predicted Mean Log Wage	1.98	0.12
Residual Mean Log Wage	-0.03	0.14
Excess over Aggregate Log Wage	0.07	0.10
Shortfall from Aggregate Log Wage	0.11	0.16
Within-Industry Standard Deviation of Log Wages	0.55	0.04
Within-Industry Standard Deviation, Predicted Log Wages	0.32	0.027
Within-Industry Standard Deviation, Residual Log Wages	0.47	0.043

Notes:

(1) All measures constructed from predicted and residual log wages are based on the regression specification described in note (1) to Table 6 as fit to CPS data on individual workers for the earnings years 1984-1986.

(2) The regression specifications estimated in section 4 are weighted by the simple average of the contemporaneous U.S. and Swedish industry employment shares, so that the weighted means and standard deviations differ somewhat from those reported in this table.

Table A.2 Wage and Education Variables by Industry

Hours-Weighted Statistics Computed from Data on Individual Workers,
U.S. Current Population Survey, 1984-1986

Sorted by Mean Log Wage (1982 $)

Industry	Mean Log Hourly Wage	Mean Residual Log Wage	St. Dev. of Log Wage	St. Dev. of Residual Log Wage	Mean Years of Schooling
Railway Transport	2.45	0.31	0.41	0.39	12.53
Legal Services	2.43	0.23	0.67	0.52	15.47
Engineering, Architectural, Technical Services	2.41	0.15	0.55	0.45	14.96
Computer and Data Processing	2.41	0.22	0.56	0.49	15.05
Research and Scientific Institutes	2.40	0.13	0.58	0.44	15.13
Electricity, Gas, Steam and Water Works	2.38	0.22	0.47	0.39	13.32
Postal Services	2.36	0.23	0.36	0.37	13.03
Business Management and Consulting	2.34	0.09	0.73	0.64	15.28
Telecommunications	2.33	0.24	0.52	0.44	13.65
Manufacture of Transportation Equipment	2.32	0.20	0.51	0.41	12.92
Advertising Services	2.31	0.13	0.69	0.57	14.68
Mining	2.29	0.20	0.56	0.48	12.81
National Defense	2.28	0.11	0.49	0.39	13.83
Accounting and Auditing	2.27	0.11	0.60	0.49	15.01
Air Transport	2.27	0.20	0.64	0.54	13.46
Manufacture of Nonelectrical Machinery	2.26	0.15	0.54	0.43	13.08
Water Transport	2.26	0.19	0.66	0.60	12.73
Chemicals, Petroleum, Coal, Rubber, Plastics	2.23	0.13	0.58	0.44	13.03
Manuf. of Professional, Scientific Instruments	2.21	0.15	0.54	0.41	13.25
Basic (Primary) Metal Industries	2.21	0.14	0.46	0.40	12.15
Public Administration	2.20	0.03	0.53	0.44	14.09
Manufacture of Pulp and Paper Products	2.19	0.13	0.51	0.41	12.37
Fire Protection	2.19	0.05	0.44	0.41	13.20
Insurance	2.17	0.13	0.58	0.48	13.88
Manufacture of Electrical Machinery	2.17	0.11	0.57	0.42	13.13
Financial institutions	2.17	0.12	0.62	0.49	14.06
Police and Security Services	2.12	0.04	0.53	0.47	13.38
Wholesale Trade	2.10	0.02	0.60	0.51	13.14
Construction	2.10	0.07	0.58	0.51	12.09
Printing and Publishing	2.10	0.04	0.57	0.49	13.34
Sanitary Services	2.09	0.03	0.50	0.44	12.11
Stone, Clay and Glass Products	2.08	0.07	0.50	0.41	11.95
Education Services	2.07	-0.12	0.59	0.49	15.31
Fabricated Metals, exc. Machinery and Equipment	2.04	0.03	0.53	0.44	12.05
Business,Professional and Labor Associations	2.04	-0.04	0.70	0.61	14.38
Medical, Dental, and Health Services	2.04	0.04	0.59	0.48	13.85

Table A.2 (continued) Wage and Education Variables by Industry

Industry	Mean Log Hourly Wage	Mean Residual Log Wage	St. Dev. of Log Wage	St. Dev. of Residual Log Wage	Mean Years of Schooling
Welfare Services	2.02	−0.09	0.54	0.45	14.41
Freight Transport by Road	2.02	0.01	0.54	0.50	12.34
Forestry and Logging	1.97	−0.09	0.56	0.47	12.58
Local and Interurban Passenger Transport	1.97	−0.06	0.56	0.54	12.46
Typing, Duplicating, and Copying Services	1.97	−0.05	0.65	0.56	13.40
Business Services n.e.c.	1.97	−0.05	0.65	0.56	13.40
Business Machinery Rental and Leasing	1.97	−0.05	0.65	0.56	13.40
Manufacture of Food, Beverages, Tobacco	1.96	−0.01	0.54	0.45	11.84
Real Estate	1.95	−0.08	0.65	0.58	12.94
Fishing and Hunting	1.94	−0.09	0.65	0.63	12.91
Recreational and Cultural Services	1.94	−0.09	0.67	0.58	13.34
Lumber, Wood Products and Furniture	1.88	−0.06	0.50	0.45	11.48
Repair Services, n.e.c.	1.87	−0.08	0.57	0.54	11.96
Miscellaneous Manufacturing Industries	1.87	−0.08	0.56	0.47	11.92
Retail Trade	1.78	−0.15	0.55	0.49	12.73
Religious, Political and Social Organizations	1.74	−0.44	0.54	0.60	14.92
Hotels and Lodging	1.70	−0.18	0.52	0.48	12.17
Manufacture of Textiles, Apparel, Leather	1.69	−0.13	0.53	0.44	11.07
Parking Services	1.67	−0.18	0.55	0.52	12.67
Other Supprting Services to Land Transport	1.67	−0.18	0.55	0.52	12.67
Other Personal Services	1.67	−0.18	0.55	0.52	12.67
Laundries and Cleaning Services	1.58	−0.24	0.46	0.44	11.38
Agriculture	1.57	−0.28	0.55	0.54	10.89
Eating and Drinking Establishments	1.55	−0.22	0.51	0.49	11.95
Private Household Workers	1.38	−0.25	0.51	0.51	10.54