

# Wage Inequality: A Comparative Perspective

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## Abstract

*Wage inequality has been increasing in most industrialised countries over the last three decades. There are, nonetheless, major differences across countries in terms of the timing and magnitude of the growth in inequality. A large number of explanations have been suggested for these observed changes, including technological progress and the computer revolution, labour market institutions and social norms, and changes in the relative supply of highly educated workers. This paper assesses the validity of these explanations in the light of large differences in inequality growth across countries, and the stunning growth in the concentration of income at the top end of the distribution.*

## 1. Introduction

The global financial crisis of 2008 has brought renewed attention to the issue of income inequality in advanced industrialised countries such as the United States, Canada and Australia. In the United States, the number of unemployed workers doubled from 7.6 million in April 2008 to 15.3 million in April 2010. It is widely believed that the recent recession was caused in large part by the behaviour of big financial institutions that took excessive risks in the years preceding the meltdown of the summer of 2008. The fact that executives in these 'bailed out' financial institutions are still receiving large performance bonuses in the face

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of mounting job losses has, predictably, led to mounting public outcry. Indeed, seeing the people believed to be responsible for the recent debacle receive large compensation while millions of taxpayers who had to 'bail them out' are losing their jobs is viewed as inappropriate and deeply unfair.

It is interesting that the issue of inequality, in general, and executive compensation, in particular, did not attract much public attention until the financial collapse of 2008. By contrast, it has been well documented in the academic literature that earnings and income inequality have increased dramatically in most rich countries over the last two or three decades. For instance, Alvaredo and Piketty (2008) show that the fraction of total income going to the richest 10 per cent of the population increased from 25 to 32 per cent in Australia, from 36 to 43 per cent in Canada, and from 32 to 42 per cent in the United States between 1978 and 2003. The increase is even more dramatic when focusing on the very top of the income distribution. For instance, the share of total income earned by the top 0.1 per cent of the population tripled from 1 to 3 per cent in Australia over the same period. In other words, people at the very top of the income distribution who used to make 10 times as much as the rest of the population are now making 30 times as much. Similarly, this share went up from 2 to 6 per cent in the United States over the same period. This means that these top earners are now making 60 times more than the average American, compared to 20 times more 25 years earlier.

Given these dramatic developments, one may wonder why it took until the recent crisis for these enormous and growing income gaps to attract more public scrutiny. One possible explanation is that the general public was simply not aware of how unequal our societies had become. Another possible explanation is that the recent crisis has shattered the view that people more or less earn what they 'deserve' in an advanced capitalist society. Under this view, which corresponds to the standard neoclassical model of the labour market, people are paid for their productivity.<sup>1</sup> CEOs are paid large amounts of money because there are extremely talented and hard-working people who have a substantial impact on the bottom line of their firms. The events of the last two years have posed a major challenge to this conventional view of wage setting in the labour market. Indeed, if the people at the helm of the financial sector took decisions that were extremely unproductive, how can it be that they are still paid so much money for their 'performance'?

Interestingly, the question of whether workers are paid for their productivity has been at the front and centre of the inequality literature. The dominant explanation for the growth in inequality is that highly skilled and talented workers have become relatively more productive than the rest of the workforce because of factors such

as technological change and computerisation.<sup>2</sup> This view has been challenged, however, by several authors who point to a number of puzzles or anomalies for which the skill-biased technical change (SBTC) theory cannot account.<sup>3</sup> In a similar vein, Bebchuk and Fried (2004) and Bertrand and Mullainathan (2001) dispute the conventional view that executives are 'paid for performance'.

The goal of the paper is to go beyond the narrower question of why executives in the financial sector are paid 'too much' for what they do and to ask the question whether the dramatic growth in inequality in rich countries can be explained by a simple wage-setting model where workers are, more or less, paid for their productivity. Two different approaches will be used to achieve this goal. First, I shall summarise the main facts about inequality changes and discuss the main messages emerging from recent research on wage inequality, focusing on what the SBTC approach can and cannot explain. Second, I shall contrast the experience of different countries over time to see whether broad-based explanations such as technological change and globalisation, as opposed to institutional features specific to each country, best account for the different experiences of different countries. It is in this sense that, as highlighted in the title, the paper follows a comparative approach.

The plan of the paper is as follows. In Section 2, I present the basic facts about inequality change in the 1980s and discuss how these facts shaped the common wisdom about the sources of inequality growth that emerged in the first part of the 1990s. Section 3 explains how a number of new developments since the early 1990s have posed a challenge to the explanations that had been proposed for the growth in inequality during the 1980s. In the light of these new developments, Section 4 proposes a set of possible explanations that may account for the experience of different industrial countries over the last 25 years. I conclude in Section 5.

## **2. Basic Facts and Explanations: The 1980s**

Since most of the inequality literature has focused on the case of the United States, I start by discussing the main stylised facts about the evolution of inequality in that country during the 1980s. I then take a broader perspective by comparing the experience of the United States to the experiences of several other industrialised countries over the same period. Having documented the basic facts, I then discuss what the common wisdom was about the source of inequality change back in the mid-1990s.

### ***2.1 Inequality Changes in the United States during the 1980s***

It is interesting to note first that, before the 1980s, inequality was no longer viewed as a topic of much interest among labour economists. For instance, a representative view of inequality at the time was that of Blinder (1980, p. 416), who remarked that '...when we turn to consider the distribution of economic welfare—economic equality, as it is commonly called—the stylised fact is one of constancy'. That view was based on the latest data available at the time Blinder wrote his paper, which indicated that 'income inequality was just about the same in 1977 ...as in 1947'. But at the very time when Blinder's paper about the constancy of the income distribution was being published, the United States entered a period of dramatic growth in inequality that would, eventually, return that country to a level of inequality in the distribution of incomes that had not been seen since the Great Depression.

In the years that followed, a number of researchers started documenting an increasingly clear trend in inequality growth. Bluestone and Harrison (1988) remarked that the share of 'low-wage' jobs had increased sharply in the first half of the 1980s. At the time this observation was controversial, as it was difficult to know whether this change was signalling a permanent growth in inequality, as opposed to a transitory change linked to the deep recession of 1981–1982. A few years later, a number of published papers were still concluding that the changes in inequality in the first part of the 1980s were, at best, modest. For instance, after examining data up to 1985, Blackburn and Bloom (1987) concluded that 'the time profile of earnings inequality, measured across individual workers, has been quite flat since the late 1960s'.

The controversy about the basic facts was quickly resolved as new data continued to show a steady growth in earnings inequality over the 1980s. By the early 1990s, a set of highly influential papers including those of Bound and Johnson (1992), Katz and Murphy (1992), Levy and Murnane (1992), and Juhn, Murphy and Pierce (1993) concluded that (i) inequality had been growing sharply in the 1980s, and (ii) the main explanation for the growth in inequality was a broad-based increase in the relative demand for skill. These studies also concluded that the relative demand for skill was already growing in the 1970s, but that it did not result in dramatic changes in inequality because relative supply was also growing over this period. For instance, Katz and Murphy (1992) concluded that the relative supply of skills linked to the entry to the labour market of the highly educated baby boom generation (Freeman 1976) in the 1970s 'outstripped' the growth in demand, resulting in a decrease in education-related wage differentials

over this period. In a similar vein, Juhn, Murphy and Pierce (1993) concluded that the within-group dimension of inequality had been growing throughout the 1970s and 1980s, thereby providing evidence that the relative demand for skills was already increasing in the 1970s.

These papers did not take a strong position on the source of the increase in the relative demand for skills. A few years later, however, a set of influential papers by Krueger (1993) and Berman, Bound and Griliches (1994) argued that skill-biased technical change (SBTC), driven by the computer revolution, was the primary source of growth in the relative demand for skill. SBTC rapidly became the prevailing explanation for the increase in the relative demand for skill. Other explanations linked to international trade or globalisation were generally not viewed as important reasons for the growth of inequality over this period.<sup>4</sup>

One important characteristic of the inequality growth documented in studies such as Juhn, Murphy and Pierce (1993) is that it was pervasive, or ubiquitous in the sense that all dimensions of inequality were growing. For example, in a standard Mincer-type human capital equation, wage inequality can grow through an increase in the returns to education and experience or because residual or within-group inequality is growing. Juhn, Murphy and Pierce (1993) show that all of these dimensions of inequality had been growing in the 1980s. They attribute this to a pervasive increase in the relative demand for all dimensions of skill (education, experience, unobserved ability and so on) that was later interpreted as being driven by SBTC.

In summary, the growth in inequality in the United States in the 1980s can be summarised by the following set of four facts:

- **Fact 1:** Dramatic increase in wage inequality at all points of the wage distribution for both men and women.
- **Fact 2:** Large increase in age and (or) experience and, especially, education wage differentials.
- **Fact 3:** Increase in wage dispersion 'within' demographic and skill groups.
- **Fact 4:** Decline in real wages for less-skilled and (or) lower-paid workers since average wages were stagnant and inequality increased.

The popularity of the SBTC hypothesis has much to do with the fact that it can account for the first three of these four observed patterns. As we shall now see, however, looking at international evidence suggests that we need a richer story

to explain the evolution of inequality across industrialised countries. Furthermore, Acemoglu and Autor (2010) argue that *Fact 4* is difficult to reconcile with SBTC in a traditional skill-based model of the labour market such as the one considered by Katz and Murphy (1992).

## **2.2 Other Countries**

If demand factors such as technological change (SBTC) or globalisation were the driving forces behind the growth in wage inequality in the United States, we should have observed a substantial growth in inequality in other advanced industrial countries that were also, presumably, affected by these changes. This simple observation illustrates how useful international comparisons can potentially be for understanding the factors behind changes in inequality observed over time.

The best example of comparative research on inequality published in the 1990s is arguably the collected volume edited by Freeman and Katz (1995a) that features detailed studies for a large number of countries, and attempts to explain the different experiences of these countries using a unified framework. A first important finding in Freeman and Katz (1995a) is that different countries had very different experiences in terms of changes in inequality. For instance, Table 1 in Freeman and Katz (1995b) shows how countries compare with one another in terms of the growth in educational and occupational wage differentials, which are an important dimension of overall wage inequality. An important finding is that, except for the United Kingdom, all other industrial countries experienced more modest changes in these differentials than the United States did. For instance, educational and occupational wage differentials grew modestly in Australia, Canada, Japan, Spain and Sweden and did not grow at all in France, Germany and Italy, and fell modestly in the Netherlands.

These findings are a major challenge to the SBTC explanation. They raise the important question as to how it can be, if technological change is the source of growing inequality, that other advanced economies that were subject to the same technological change did not experience an increase in inequality. The response suggested by Freeman and Katz (1995b) is that supply and demand (SBTC) is only part of the explanation for inequality growth. The other part of the explanation has to do with wage-setting institutions. Indeed, Freeman and Katz (1995b) propose what they label an 'SDI' (supply, demand, institutions) explanation to account for the different experiences of countries that are all affected by the same demand shocks, but where wages adjust differently because of mitigating factors such as supply changes and institutions.

For instance, in Anglo-Saxon countries such as the United States, Britain and Canada—where the wage-setting is decentralised and unions are weak—a negative demand change depresses the wages of less-skilled workers. By contrast, in France or Germany, where the wage-setting is more centralised and unions are strong, wages of less-skilled workers remain stable despite the same negative demand change, and so does wage inequality.<sup>5</sup>

The other important observation made by Freeman and Katz is that while the United States was traditionally the leader in terms of education, other countries have caught up since the 1970s.<sup>6</sup> Just as education wage differentials did not increase in the United States in the 1970s because of the increased supply of highly educated baby boomers, the increased supply in other countries contributed to a slower growth in inequality during the 1980s. In other words, demand clearly won the race against supply in the United States during the 1980s, but the race was more 'even' in most other countries during the same period.<sup>7</sup>

### **2.3 Explanations for Inequality Change Suggested in the Early 1990s**

Despite the challenge raised by international comparisons, SBTC remained the leading explanation for the growth in inequality throughout the 1990s. For example, ten years after Levy and Murnane's influential survey paper on inequality growth was published in the *Journal of Economic Literature* (Levy and Murnane 1992), the journal published another paper on the same topic (Acemoglu 2002) that emphasised the importance of technological change in inequality growth. Acemoglu considers a more sophisticated form of endogenous technological change, but he reaches the conclusion again that technology was the leading source of inequality growth in the United States throughout the 1970s, 1980s and 1990s.

The popularity of the SBTC hypothesis aside, even back in the 1990s there were a number of reasons to believe that it only accounted, at best, for some of the observed changes in wage inequality. I have already noted that, according to Freeman and Katz (1995b), institutional factors must be considered in order to understand the different experiences of different countries. Interestingly, even in the United States there was already growing evidence in the mid-1990s that institutional change was part of the explanation for the growth in wage inequality observed in the 1980s.

In particular, both Card (1992) and Freeman (1993) looked at the effect of de-unionisation on wage inequality and concluded that it explained up to 20 per

cent of the increase in the variance of log wages for US males in the 1980s. Another important wage-setting institution at the bottom end of the wage distribution is the minimum wage, which declined substantially in real terms between 1981 and 1990. Over this period, the nominal value of the minimum wage remained unchanged at \$3.35 while the CPI increased by 44 per cent; this resulted in a 30 per cent decline in the real value of the minimum wage.

DiNardo, Fortin and Lemieux (1996) conclude that this decline had a large impact on wage inequality among women and a smaller, but still substantial, impact among men. This finding was later confirmed by Lee (1999), who reached the stronger conclusion, after allowing for spillover effects, that all of the increase in wage inequality in the lower end of the wage distribution was due to the decline in the real value of the minimum wage.<sup>8</sup>

Taken together, these findings are a challenge to the view that, even in the United States, inequality growth in the 1980s was mostly due to a pervasive increase in the relative demand for skill, or SBTC. Indeed, the evidence is instead consistent with the SDI explanation of Freeman and Katz, wherein demand-side factors are only one among a number of possible explanations for secular changes in wage inequality. In retrospect, it may well be that the dramatic growth in US wage inequality in the 1980s, both at the lower and the upper ends of the distribution, was a coincidence attributable to the fact that a number of different factors contributed to the expansion of inequality at different points of the wage distribution. This confluence of factors in the 1980s may have given the misleading impression that a single explanation such as SBTC, operating at all points of the distribution, could account for all of the increase in US wage inequality.

One last point is that, even in the mid-1990s, it was known that one stylised fact about inequality growth (*Fact 3* above) was not very robust to the choice of data. Juhn, Murphy and Pierce (1993) had argued that within-group inequality had been growing in the 1970s, supporting the view that the relative demand for skill was already increasing in the 1970s, and that the increase in inequality in the 1980s was not just an 'episodic' phenomenon. This evidence relied on data on the weekly earnings of full-time male workers in the March supplement of the Current Population Survey (CPS). By contrast, both Card and Lemieux (1996) and DiNardo, Fortin and Lemieux (1996) found that within-group wage inequality did not increase for men (and declined for women) during the 1970s. This finding was based on an alternative measure of wages from the May and Outgoing Rotation Group (ORG) Supplements of the CPS. As a result, it is now

widely accepted that the growth in within-group inequality in the 1970s is not robust to the choice of data.<sup>9</sup>

In summary, while SBTC was the leading explanation for the growth in inequality back in the 1990s, it was known at the time that the explanation had some important shortcomings. First, it could not account for the differences in inequality growth across advanced countries. Second, even within the United States there was clear evidence that institutional factors were also an important part of the story, especially at the lower end of the wage distribution. Finally, it relied in part on the view that within-group inequality was already increasing in the 1970s, which was not robust to the choice of wage measure.

In the light of these facts, it appears that Freeman and Katz's SDI explanation is a more promising way of accounting for changes in inequality up to 1990 than is a parsimonious explanation relying solely on changes on the demand side linked to SBTC. With this in mind, I look in the next section at what has happened to wage inequality in industrialised countries since the early 1990s, and I later discuss in Section 4 what these new developments teach us about the possible explanations for inequality growth.

### **3. Changes in Wage Inequality Since 1990**

As in the previous section, I first look at the case of changes in the wage distribution in the United States, since most of the recent studies have focused on that country. In the second part of the section I look at the broader picture by considering the cases of other rich countries.

#### ***3.1 Changes in the Wage Distribution in the United States***

As we saw above, a number of studies published in the mid-1990s indicated that SBTC and other sources of change in the relative demand for labour were not the sole factors involved in the growth in inequality in the 1980s. Institutional changes linked to de-unionisation and the decline in the minimum wage also appear to be important explanations for growing inequality.

A few years later, a number of other papers looking at evidence from the 1990s started raising a number of challenges to the SBTC-based explanation for the growth in inequality. A first challenge is linked to the timing of the increase in wage inequality. For example Card and DiNardo (2002) and Beaudry and Green (2005) remark that much of the increase in the return to education was concentrated in

the 1980s. Similarly, Lemieux (2006b) reports that the growth in residual wage inequality is concentrated in the 1980s once we control for composition effects linked to the changing distribution of education and experience. This set of facts is hard to reconcile with the standard SBTC story that would have predicted a continuing and steep growth in wage inequality throughout the 1990s. Card and DiNardo (2002) point out that 'IT-related technological change has been going on since at least the 1970s and has continued throughout the 1980s and 1990s. Moreover, there is some evidence ... that the rate of technological change accelerated in the 1990s, relative to the 1980s.' (Card and DiNardo 2002, p. 740). Casual evidence indeed suggests that the internet revolution that took place in the 1990s reshaped the labour market and the entire economy in a way that is at least as important as the introduction of the first personal computers in the early 1980s.

Additional evidence also suggests that, far from being 'ubiquitous', changes in the distribution of wages are increasingly concentrated in the top end of the wage distribution. For instance, both Mincer (1997) and Deschênes (2002) show that (log) wages are an increasingly convex function of years of schooling. This means that the wage gap between college post-graduates and college graduates (or between college graduates and high school graduates) has been increasing much faster than the wage gap between high school graduates and high school dropouts. Card (2009) makes a similar observation when discussing the potential contribution of immigration to the growth in wage inequality in the United States.

A second piece of evidence suggesting that inequality has mostly been increasing at the top end of the distribution since 1990 is the work of Piketty and Saez (2003) on the distribution of taxable earnings. The evidence based on their analysis of tax records indicates a dramatic growth in the concentration of income and earnings at the very top end of the distribution over the last few decades. In other words, the earnings of individuals at the very top have increased much faster than those of workers in the middle or bottom of the distribution have. One advantage of tax data is that they provide accurate information on the earnings of people at the top of the distribution; these earnings are typically 'topcoded' in publicly available data sources such as the CPS or the US Census. As I also discuss below, another advantage of tax data is that they are generally available for a large number of countries over long time periods, which is very useful for comparative work. One important drawback of tax data is that they do not typically contain a detailed set of socio-economic variables such as education, union status and so

on that could be used to test directly a variety of explanations about the sources of change in wage inequality.

A third piece of evidence about the importance of changes at the top end of the wage distribution is obtained by looking at the residual distribution of wages, that is the distribution of wages adjusted for standard explanatory variables such as years of experience and education. The changes in residual inequality also appear to be concentrated at the top end. For example, Lemieux (2006b) shows that the within-group variance of wages grew substantially among college-educated workers, while it remained relatively unchanged over time for most other groups. Similarly, Autor, Katz and Kearney (2008) show that 'top end' residual inequality (the difference between the 90th and 50th percentile of the distribution of residuals, or the '90–50' gap) increased steadily over time, while residual inequality at the low end (the 50–10 gap) actually decreased after 1990.

These changes and a few others are summarised by Lemieux (2008), who analyses recent data on hourly wages from the May 1973–1978 and the ORG 1979–2005 supplements of the CPS.<sup>10</sup> Table 1 contains a summary of the main findings. The measures of inequality reported in the table are computed separately for men and women in five different time-intervals: 1973–75, 1978–80, 1988–90, 1998–2000 and 2003–05. The last two columns show the changes in the different measures of wage dispersion over the first (1973–75 to 1988–90) and second half (1988–90 to 2003–05) of the sample period. The main findings reported in the table are as follows:

1. The change in broad measures of inequality (standard deviations and 90–10 gap shown in Table 1) is three times as large in the 1970s and 1980s as it was in the 1990s and 2000s. A closer examination of the table also indicates that all of the growth in inequality prior to 1988–90 is concentrated in the 1980s. This holds for both men and women.
2. Wage dispersion at both the 'low end' (50–10 gap) and the 'top end' (90–50 gap) of the distribution were growing prior to 1988–90. In the 1990s and 2000s, however, the 50–10 gap stagnates for women and declines for men. By contrast, the 90–50 gap keeps increasing as fast in the 1990s and 2000s as it did in the 1970s and 1980s.
3. Education wage differentials (measured relative to high school graduates in Table 1) evolve in the same way as overall measures of wage inequality.<sup>11</sup>

All differentials grow quickly in the 1980s, but remain more stable during the other time periods.

4. As in the case of overall inequality, changes in education wage differentials are concentrated at the top end after 1988–90. At the low end of the education distribution, the gap between high school dropouts and high school graduates expands by 0.045 and 0.085 in the 1970s and 1980s for men and women, respectively. The growth completely stops, however, and even reverses itself for men after 1988–90. By contrast, the gap between college post-graduates and high school graduates keeps growing as fast after 1988–90 as it did before this period.

The evidence from CPS data strongly supports the findings of the studies mentioned above. Recall that these studies generally indicate that the recent growth in inequality is concentrated at the top end of the distribution, which is quite different from the situation that prevailed before 1990. In those earlier years, the increase in inequality was pervasive, or ubiquitous in the sense that wage differentials increased at essentially all points of the distribution.

### **3.2 Other Countries**

Recall from Section 2.2 that an important puzzle in the 1980s is that inequality increased sharply in some countries while remaining little changed in others. In particular, Freeman and Katz (1995b) show that English-speaking countries in general, and the United States and United Kingdom in particular, experienced a dramatic growth in inequality. By contrast, inequality remains relatively stable in Japan and most continental European countries. The main question I now ask here is whether this pattern repeated itself in the 1990s and 2000s.

To answer this question, I first discuss the recent evidence based on tax data. As mentioned earlier, one important advantage of tax data is that they provide a relatively uniform way of comparing the evolution of income and earnings at the top end of the distribution.<sup>12</sup> This is useful in the setting considered here, where most of the recent increase in US inequality has taken place precisely in that part of the distribution. In the light of this, I first discuss, using tax data, how the experience of other countries compares to that of the United States.

Piketty and Saez (2006) compare the evolution of top income shares (as measured by the share of income or earnings going to the top 10 or 1 per cent of the distribution) in France and Japan to that of three English-speaking countries: the United States, Canada and Britain. The evidence reported by Piketty and Saez

shows that, as in the 1980s, these English-speaking countries experienced a steep growth in inequality. By contrast, the income shares remained remarkably stable in France and Japan over the post-war period.<sup>13</sup>

Alvaredo and Piketty (2008) report similar results for a larger sample of countries where the group of English-speaking countries now includes Australia, New Zealand and Ireland, while a large number of European countries are also included in addition to those considered by Piketty and Saez (2006): Germany, the Netherlands, Switzerland, Sweden, Spain and Italy. The results reported by Alvaredo and Piketty are striking. Top income shares have increased steadily in all six English-speaking countries since about 1980. By contrast, the income shares have remained more or less constant in non-English speaking European countries and in Japan during the same period.

Consistent survey data over countries and time are not as widely available as tax data are. The available evidence is generally consistent, however, with the inequality trends indicated by tax data. An additional advantage of survey data over tax data is that they contain much more information about the characteristics of individuals such as education, union status, industry and occupation and so on. These additional variables are essential for examining the reasons behind changes in inequality. In the remainder of this section, I provide a partial overview of the evidence obtained from using survey data.

Using comparable survey data for the United States, the United Kingdom and Canada, Card, Lemieux and Riddell (2003) show that inequality has increased in all three of these countries since the late 1980s. They also show that, as in the United States, the rate of unionisation declined in both Canada and the United Kingdom during this period and that de-unionisation accounts for a substantial part of the observed growth in wage inequality.

Interestingly, several non-English-speaking countries also experienced some changes in labour market institutions over time, and survey data indicate that inequality was perhaps not quite as stable as was found from the tax data. For example, the study of Manacorda (2004) for Italy indicates that inequality first declined in that country in the 1970s, but started increasing in the mid-1980s. Manacorda argues that these changes are linked to the 'rise and fall' of the Scala Mobile—a country-wide indexation system that used to compress wages by giving larger relative cost-of-living adjustments to workers at the bottom end of the distribution than to workers at the top end.

The case of another large European country, Germany, is more controversial. Earlier studies based on the German Socio Economic Panel (GSOEP) indicate that inequality remained stable over time in this country (see for example, Beaudry and Green 2003). This was attributed, at least in part, to the belief that unions remained strong over time and managed to keep the wage structure relatively compressed. Dustmann, Ludsteck and Schönberg (2009) challenge both of these views, using new social security data (the IAB sample), and conclude that inequality in fact increased while the unionisation rate declined substantially over the last 20 years. Dustmann, Ludsteck and Schönberg also show that these two factors are clearly linked and that de-unionisation accounts for a substantial part of the growth in inequality in Germany over this period. Although the pattern of change in inequality and institutions across countries appears to be more complex than was previously thought, the evidence remains that institutions play an important role in the determination of wage and income inequality. From that point of view, the recent evidence remains supportive of Freeman and Katz's SDI explanation for the pattern of change in earnings inequality over time in different countries.

#### **4. Possible Explanations for the Recent Changes in Inequality**

Fifteen years ago, Freeman and Katz suggested a supply-demand-institution (SDI) explanation for the changes in inequality that had been observed in different countries during the 1980s. In the light of the recent developments documented in Section 3, is it time to revisit the SDI explanation? The goal in this section is to look at several explanations for the observed changes that have been suggested in the literature and to see which of these explanations best 'fit the facts'.

Before doing so, it is useful to summarise the main developments in inequality since 1990 that need to be explained. First, inequality growth in the United States has been concentrated at the top end of the distribution since about 1990. By contrast, inequality at the bottom end of the distribution has been declining. Second, new studies based on tax data suggest that inequality has been growing in English-speaking countries, but has remained much more stable in continental Europe and Japan. In the case of English-speaking countries, the growing concentration of income at the top is staggering, and has now reached a level unseen since the Great Depression.

In other words, the main challenge is to explain why inequality has grown at the top end in some countries while remaining stable in others. I now briefly present the various explanations that have been suggested to account for recent changes

in inequality and I discuss the extent to which they succeed in explaining the observed facts.

#### **4.1 Technological Change Again: Skilled versus Routine Tasks**

The original SBTC explanation simply states that computer-based technologies are biased in favour of skilled workers, without attempting to dwell on the mechanisms underlying the stated complementarity between technology and skills. As I discussed earlier, a major weakness of the SBTC explanation is that it simply cannot account for the fact that inequality declined at the lower end of the distribution during the 1990s. This suggests that technological change is now biased against skilled workers, which is inconsistent with the fact that inequality kept expanding at the top end during the same period.

Autor, Levy and Murnane (2003) propose a more 'nuanced' view of skill-biased technological change which introduces an important distinction between routine tasks and skilled tasks. The idea is that the introduction of computer and information technologies has not simply depressed the relative demand for less-skilled workers, as was assumed in earlier studies such as Berman, Bound and Griliches (1994). Rather, what computer and information technologies have done is to depress the return to 'routine' tasks that can now be executed by computer technologies, irrespective of whether they required skilled or unskilled labour in the first place. Autor, Katz and Kearney (2006) and Goos and Manning (2007) argue that this nuanced view of technological change can help account for the polarisation of wages that has been observed since the late 1980s. Under this type of technological change, it is plausible that moderately skilled workers who used to perform routine tasks experienced a decline in their relative wages during this period. To the extent that these workers are around the middle of the skill distribution, technological change could explain why wages in the middle of the distribution fell more than those at the bottom and top ends of the distribution did.

Note that introducing the concept of 'tasks' represents a significant departure relative to the standard 'skill-based' model of the labour market that has been considered in most inequality studies (for example, Katz and Murphy 1992, and Card and Lemieux 2001). Acemoglu and Autor (2010) refer to this traditional skill-based approach as the 'canonical' model of the labour market, and discuss in detail how this model fails to account for several of the changes in the distribution of wages observed since about 1990.

Acemoglu and Autor propose instead what they call a Ricardian model of the labour market, where occupations and the tasks performed in these occupations play a fundamental role that goes above and beyond skills. In their setting, skills are supplied to occupations (or tasks) to produce goods. Workers of different skill levels specialise in different occupations. As a result, changes in the demand or the structure of production in different occupations due to technological progress or globalisation can have different effects at different points of the skill distribution. This provides a more flexible setting for understanding the factors behind the recent polarisation of the wage distribution.

What is the verdict on the 'routine-based' explanation of inequality changes? On the plus side, unlike the old SBTC explanation, the routine-based explanation is flexible enough from a theoretical point of view to account for the observed polarisation in wages. Autor, Katz and Kearney (2006) also point out that changes in the distribution of employment across occupations are consistent with the routine-based explanation.<sup>14</sup>

On the negative side, there is still little direct evidence on the connection between the 'routinisation' hypothesis and changes in wages at different points of the distribution. As a result, the quantitative importance of this explanation relative to others has not yet been firmly established.<sup>15</sup> Furthermore, the routinisation hypothesis, just like SBTC, cannot really explain why inequality expanded in some countries but not in others. For instance, Goos, Manning and Salomons (2009) find that changes in the occupational distribution of employment have been very similar across countries, which is consistent with the routinisation story playing a similar role in different countries. They find no connection, however, between changes in the distribution of occupational employment and changes in inequality. This suggests that the routine-based explanation cannot account for the important differences in inequality changes across countries.

#### **4.2 Globalisation and Offshoring**

Another demand-side explanation that has attracted a lot of attention in the popular press is globalisation and offshoring. Back in the 1980s, international competition from Japan in particular was viewed as a potential cause of the 'de-industrialisation of America' and the 'disappearing middle' of the wage distribution. The international competition hypothesis was mostly dismissed as a potential explanation for the growth in US wage inequality during the 1980s for two reasons. First, Murphy and Welch (1991) and Bound and Johnson (1992) found that industrial change in general did not play much of a role in the growth in wage inequality. Furthermore,

Berman, Bound and Griliches (1994) argued that the pattern of change in skilled employment across industries was not consistent with the predictions of a standard trade model, and suggested SBTC as the alternative explanation for the observed changes.

More recently, Feenstra and Hanson (2003) and others have pointed out that trade in intermediate inputs, which can lead to within-industry changes, was a leading alternative explanation to SBTC for the increase in the relative demand for skill. Focusing on intermediate as opposed to final goods and services is consistent with popular perceptions that offshoring is now the key channel through which globalisation affects domestic employment and inequality.

There have only been limited attempts, however, at linking offshoring to changes in the wage distribution. Liu and Trefler (2008) do not find any impact of service offshoring on US wages. Blinder and Krueger (2009) develop a broader survey-based measure of the 'offshorability' of jobs (the threat of offshoring) but do not find any systematic effect of this measure on wages. One exception to these negative findings is Firpo, Fortin and Lemieux (2010), who do conclude that offshorability (measured using an approach similar to Blinder and Krueger 2009) is linked to a decline in wages in the middle of the distribution.

On balance, there is at best some weak evidence that offshoring has contributed to the growth in wage inequality in the United States over the last few decades. As in the case of technological change, a related question is whether globalisation and offshoring can account for the fact that changes in inequality were quite different in different countries. This is unlikely to be the case, since offshoring is likely to affect all rich countries in similar ways. This conjecture is confirmed by Goos, Manning and Salomons (2009) who do not find much impact of offshoring on the occupational structure of employment of EU countries.

### **4.3 Institutions**

As I discussed earlier, several studies have shown that, in the United States, the decline in the real value of the minimum wage was a key explanation for the increase in inequality at the lower end of the wage distribution during the 1980s (DiNardo, Fortin and Lemieux 1996, Lee 1999). As shown in Figure 1, however, the real value of the minimum wage kept fluctuating but did not exhibit much of a systematic trend after about 1990 (the minimum wage is on an inverted scale).

Figure 1 also shows the evolution of the gap between the 50th and the 10th percentile of the wage distribution for women during the same period.<sup>16</sup> The

fit between the two series is remarkable. Not surprisingly, the two series move together during the 1980s. While they do not follow any systematic trend after the late 1980s, they keep fluctuating together over time. In particular, the 50–10 gap expands during periods when the minimum wage is falling in real terms and falls during periods when the minimum wage is increased. In other words, the more recent data strengthen the earlier conclusion reached in the literature that the minimum wage is a key factor for explaining inequality at the bottom end of the distribution.

The decline in the rate of unionisation has also been shown as a key factor in the expansion of inequality in the United States during the 1980s. Since unionisation kept declining after the late 1980s, it should have kept contributing to changes in inequality over this period. But since inequality expanded at the top end and declined at the low end during this period (see Table 1), a good explanation for these changes needs to have different impacts at the two ends of the wage distribution.

As it turns out, existing research does indeed suggest that de-unionisation has opposite impacts at the two ends of the wage distribution. For instance, DiNardo, Fortin and Lemieux (1996) find that the 10.8 percentage point decline in the rates of unionisation for US males between 1979 and 1988 did contribute to a 0.040 increase in the 90–50 gap, but to a 0.019 *reduction* in the 50–10 gap. The negative effect of de-unionisation on inequality at the lower end of the distribution was more than offset, however, by the decline in the minimum wage over the same period. DiNardo, Fortin and Lemieux (1996) find that this factor resulted in a 0.050 expansion in the 50–10 gap.

Taken together, de-unionisation and changes in the minimum wage contributed to an expansion in inequality at both ends of the distribution during the 1980s. But since the minimum wage did not change much after the late 1980s (Figure 1), we would expect (i) the total effect of institutions to be driven by the continuing decline in the rate of unionisation in the post-1980s period and (ii) this effect to go in the opposite direction at the two ends of the distribution.

Interestingly, this is precisely what Firpo, Fortin and Lemieux (2010) find in their study of the determinants of inequality changes for men after the 1980s. They conclude that, for men, de-unionisation accounts for about 25 per cent of the growth in the 90–50 gap, and 25 per cent of the decline in the 50–10 gap. Together with the evidence reported in Figure 1, this suggests that institutional

change remains a key explanation for the changes in wage inequality observed in the United States over the last 10 or 20 years.

Let us now turn to the case of other countries to see whether institutions can also help to explain cross-country differences in the changes in wage inequality.

Recall that Freeman and Katz (1995b) viewed institutions as an important explanation for the different experiences of different countries in terms of inequality change. Several studies published since then have, if anything, reinforced this earlier conclusion. For instance, Blau and Kahn (1996) find that unionisation rates are negatively correlated with inequality across countries. Card, Lemieux and Riddell (2003) show that (i) the effect of unions on inequality is similar in Canada, the United States and the United Kingdom and (ii) the much faster decline in unionisation rates in the United States and the United Kingdom relative to Canada helps explain why inequality grew faster in these two countries, at least for men. As discussed earlier, single country studies such as Manacorda (2004) and Dustmann, Ludsteck and Schönberg (2009) also tend to confirm that institutions played an important role in the changes in wage inequality in these countries after the 1980s.

On balance, the recent evidence suggests that institutions are still a big part of the inequality story for the post-1980s period. In that sense, there is little reason to revisit the conclusion reached by Freeman and Katz 15 years ago about the importance of institutions in changes and differences in wage inequality across countries.

#### **4.4 Pay-setting Institutions and Top Earners**

One limitation of traditional labour market institutions such as unionisation and minimum wages is that they probably play a limited role at the top end of the distribution where wage inequality has been growing steadily since the 1980s. Taking a broader look at the issue reveals, however, that other pay-setting institutions may have been playing an important role in the growth in wage inequality. For instance, a number of papers have looked at the role of changes in 'the way CEOs are paid' as a potential explanation for the phenomenal growth in their earnings over the last few decades.

In a standard competitive model, CEOs, like other workers, are simply paid for their marginal product. Some authors such as Gabaix and Landier (2008) have argued that a market, or competitive, model of CEO pay could explain the observed growth in compensation. Other authors are more sceptical. For instance, both

Bebchuk and Fried (2004) and Bertrand and Mullainathan (2001) dispute the conventional view that executives are 'paid for performance'. They instead argue that CEOs are much more likely to be directly or indirectly 'setting their own pay' relative to other workers. A related question is why CEO pay has increased much more in English-speaking countries than in other countries such as France or Germany. Piketty and Saez (2003) suggest that this may reflect differences in social norms across countries. While this explanation is appealing at an intuitive level, it is difficult to test empirically.

Note also that while CEO pay tends to attract the headlines, CEOs represent only a small fraction of top earners. Furthermore, while the growth in earnings at the very top end has been staggering, much of the inequality growth has also happened at lower wage levels. For instance, Table 1 documents a large and steady growth in the gap between the 90th and the 50th percentile of the wage distribution. Since CEOs of large corporations have earnings that put them well above the 90th percentile, one needs to take a broader view on the role of pay-setting institutions to account for these widespread changes in the wage distribution.

One paper that takes a broader look at this issue is Lemieux, MacLeod and Parent (2009) which looks at the general role of performance pay in the growth in wage inequality. Using survey data from the Panel Study of Income Dynamics (PSID), Lemieux, MacLeod and Parent (2009) show that an increasingly large fraction of workers have part of their earnings linked to performance bonuses and that this contributed to a substantial part of the growth in inequality in the top end of the distribution. The idea here is that wages are becoming more closely connected to individuals' productivity, which leads to an increase in the wage gap between more productive and less productive workers.

#### **4.5 What about Supply?**

Relative to explanations based on the demand side of the market, supply-based explanations are a promising way of accounting for differential changes in inequality across countries. For instance, if different countries invest different resources in higher education, one may expect the supply of highly educated workers to grow at different rates in different countries. Goldin and Katz (2008) show that the United States has lost its lead in terms of higher education. In other words, the relative supply of highly educated workers grew at a slower rate in the United States relative to other countries. Goldin and Katz then argue that the relatively slower growth in the supply of highly educated workers is a leading reason why wage inequality, as measured by the wage gap between college and high-school

educated workers (the college–high school wage gap), grew in the United States after the late 1970s. As the title of their book—*The Race between Education and Technology*—indicates, the evolution in the college–high school gap depends on how fast supply (education) and demand (technology) are changing over time. When both factors grow at the same pace, the college–high school wage gap remains stable. But when the rate of growth in demand induced by technological change outpaces the rate of growth in supply, the wage gap increases and inequality expands.

One appealing feature of this race between supply and demand is that it can account for both the growing inequality in the United States (for example, Katz and Murphy 1992) and for the fact that inequality did not expand as much in countries where the supply of highly educated workers expanded faster than it did in the United States. For instance, Murphy, Riddell and Romer (1998) argue that the college–high school gap did not expand as fast in Canada as in the United States because of faster growth in the proportion of Canadians with university education in the 1980s and 1990s. Since the educational advantage of US workers has steadily eroded throughout the 1980s, 1990s and 2000s (Goldin and Katz 2008), the supply explanation meets the challenge of accounting for both (i) some of the continuing growth in inequality in the United States after the 1980s and (ii) some of the difference in the evolution of inequality across countries.

It is not as clear, however, to what extent supply factors can account for changes in inequality at the top end of the distribution. This is, after all, the part of the distribution where inequality has been expanding the fastest since the late 1980s. One possible explanation for the phenomenon is that workers with a high school degree or less are very close substitutes for each other. Accordingly, relative wages among these less-educated workers who dominate the bottom end of the distribution should remain stable over time. By contrast, if workers with some post-secondary education are imperfect substitutes for less-educated workers, inequality should increase at the upper end of the distribution when the growth in demand for highly educated workers exceeds supply.<sup>17</sup> A related explanation raised by Lemieux (2006a) is that an increase in the average rate of return to education induced by supply and demand factors should yield a ‘convexification’ of the wage distribution (more inequality growth at the top than at the bottom of the distribution) in a model where there is some individual heterogeneity in the return to education.

Recent research also indicates that supply factors have had an impact on inequality because of composition effects. For instance, Lemieux (2006b) shows that most

of the growth in residual—or within-group—wage inequality is linked to changes in the age and education distribution of the workforce. Wages tend to exhibit more residual dispersion for older and more educated workers. Since the US workforce has grown older and more educated since the late 1980s, this has resulted in more inequality in the labour market. Dustmann, Ludsteck and Schönberg (2009) reach a similar conclusion for Germany.

Likewise, Card (2009) shows that composition effects linked to immigration have contributed to the increase in wage inequality. The reason is that wages and skills are more unevenly distributed among immigrants than native workers. In particular, immigrants from Mexico and Central America tend to have very low levels of education, while immigrants from India and rich countries tend to be much better educated than the native population. As a result, wage dispersion is higher among immigrants than natives, and an increase in the proportion of immigrants results in an increase in wage inequality.

## **5. Conclusion: Is it Time to Revisit the SDI Explanation?**

Three key messages emerge from the discussion in Section 4. First, while demand factors linked to technological change may be a leading factor behind the secular growth in wage inequality (or the more recent polarisation of wages), they cannot account for the large differences in inequality growth observed across countries. Second, supply factors and institutions explain more of the differences across countries than does demand. Third, none of the suggested explanations provides a compelling answer to the question of why inequality at the very top end of the distribution has increased so much in some countries but not in others.

In the light of this, I draw two main conclusions. First, it does appear that the SDI explanation introduced by Freeman and Katz 15 years ago is still alive and well, in the sense that no single explanation (supply, demand or institutions) can account for all of the changes in wage inequality observed across countries. What is still lacking, however, is a formal assessment of how much of the changes in inequality in the different countries can be accounted for by the different elements of the SDI explanation. Conducting such a quantitative assessment using comparable data for a large set of countries is a demanding, yet important, challenge for future research.

The second conclusion is that we still do not understand very well why inequality at the very top end of the distribution has increased so much in countries such as the United States, Canada and Australia. I have discussed a number of promising

research avenues linked to pay-setting institutions for high-wage workers, social norms and so on. More research is needed to assess whether these types of explanation can fully account for the large increase in the earnings of workers at the very top end of the wage distribution.

## Endnotes

<sup>1</sup> See, for instance, Welch (1999).

<sup>2</sup> See, for instance, the surveys of Katz and Autor (1999) and Acemoglu (2002).

<sup>3</sup> See, for instance, Card and DiNardo (2002) and Lemieux (2008).

<sup>4</sup> Berman, Bound, and Griliches (1994) dismiss the trade explanation on the basis that most of the increase in the use of skilled labour happened within industries, while a traditional Heckscher-Ohlin model would predict that changes should happen between industries. More recently, however, authors such as Feenstra and Hanson (2003) have pointed out that trade in intermediate inputs, which can lead to within-industry changes, was a principal alternative explanation to SBTC for the increase in the relative demand for skill. Their focus on intermediate, as opposed to final goods and services, is consistent with popular perceptions that offshoring is now the key channel through which globalisation affects domestic employment and inequality.

<sup>5</sup> See Card, Kramarz and Lemieux (1999) for more evidence of this in the case of Canada, the United States and France.

<sup>6</sup> See also Goldin and Katz (2008) who show how the United States has gradually lost its advantage in terms of the level of education of its population relative to other rich countries.

<sup>7</sup> See, for instance, Murphy, Riddell and Romer (1998) who argue that a higher supply growth rate prevented educational wage differential from growing as much in Canada as in the United States during the 1980s and early 1990s.

<sup>8</sup> Autor, Manning and Smith (2010) find a smaller, though still substantial, effect of the minimum wage on changes in US wage inequality during the 1980s.

<sup>9</sup> By contrast, the growth in within-group inequality in the 1980s and the evolution of the college-high school wage gap are very similar in the March and May ORG CPS. See Lemieux (2006b; 2008) for a more detailed discussion of the 'debate' about whether or not within-group inequality increased during the 1970s.

<sup>10</sup> See Lemieux (2006b) for more detail on how the CPS data are processed.

<sup>11</sup> These education wage differentials are computed for each single year of potential labour market experience, and then averaged out over all experience groups using the average shares of experience over the whole 1973–2005 period. This is a more general way of adjusting for experience than in a standard Mincer-type regression, where a low-level polynomial in experience is included in the regression. The approach used here is equivalent to running separate regressions for each year with a full set of experience and education (five groups) dummies, and then averaging out (using a fixed weighted average across experience groups) the returns to education within each experience cell.

<sup>12</sup> Note also that Leigh (2007) provides some evidence that measures of inequality based on tax data track more standard inequality measures, obtained by using survey data, fairly well.

<sup>13</sup> See also Atkinson and Leigh (2010), who report similar evidence on the evolution of top income shares in English-speaking countries during the 20th century.

<sup>14</sup> Lefter and Sand (2009) show, however, that this particular result is sensitive to the way occupations are coded to be consistent over time. They instead conclude that changes in the distribution of occupational employment are not very different in the 1980s and 1990s. Taking this finding at face value suggests that the routine-based explanation has a hard time explaining why inequality at the lower end of the distribution contracted during the 1990s after expanding dramatically during the 1980s.

<sup>15</sup> Two exceptions are Autor and Dorn (2010), who look at cross-city evidence in the United States, and Firpo, Fortin and Lemieux (2010), who explicitly link the task content of occupations to changes in the wage distribution.

<sup>16</sup> This gap is computed as the difference between the log of the 50th percentile and the log of the 10th percentile using CPS data. The CPS data are processed in the same way as in Lemieux (2006b), which provides much more detail on the various data issues.

<sup>17</sup> See Goldin and Katz (2008) and Card (2009) for evidence that the elasticity of substitution is indeed larger (education groups are closer substitutes) at the bottom than at the upper end of the education distribution.

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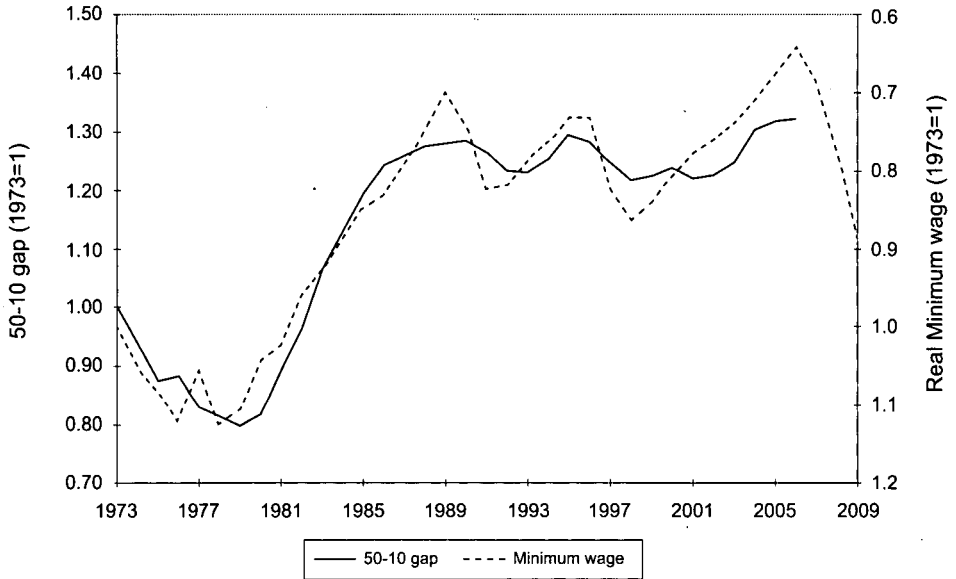
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Table 1: Summary Measures of Wage Inequality in the United States

	1973-1975	1978-1980	1988-1990	1998-2000	2003-2005	Change:	
						1973-75 to 1988-90	1988-90 to 2003-05
<b>A. MEN</b>							
Standard deviation	0.501	0.499	0.571	0.580	0.598	0.072	0.027
90-10 gap	1.266	1.262	1.486	1.487	1.557	0.224	0.071
50-10 gap	0.681	0.693	0.787	0.721	0.729	0.094	-0.058
90-50 gap	0.585	0.569	0.699	0.767	0.828	0.130	0.129
<b>Gap relative to HS graduates</b>							
High school dropouts	-0.246	-0.253	-0.297	-0.295	-0.287	-0.045	0.010
Some college	0.116	0.108	0.165	0.168	0.183	0.058	0.018
College graduates	0.369	0.328	0.466	0.521	0.545	0.138	0.079
Post-graduates	0.365	0.361	0.568	0.715	0.766	0.207	0.198
<b>B. WOMEN</b>							
Standard deviation	0.435	0.414	0.512	0.531	0.549	0.098	0.037
90-10 gap	1.033	0.989	1.314	1.353	1.404	0.325	0.090
50-10 gap	0.470	0.409	0.633	0.605	0.633	0.223	0.001
90-50 gap	0.564	0.580	0.681	0.748	0.770	0.101	0.089
<b>Gap relative to HS graduates</b>							
High school dropouts	-0.221	-0.191	-0.275	-0.275	-0.281	-0.085	-0.005
Some college	0.164	0.141	0.212	0.193	0.204	0.070	-0.008
College graduates	0.376	0.311	0.459	0.534	0.547	0.149	0.088
Post-graduates	0.558	0.489	0.629	0.770	0.790	0.140	0.161

Notes: Data based on the US Current Population Survey (May Supplement from 1973 to 1978, and Merged Outgoing Rotation Groups Files for later years. The measures of wage dispersion are computed by pooling groups of three years shown in each column entry. See text for detail.

**Figure 1: 50-10 Gap for Women vs. Minimum Wage**



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