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Earnings Volatility and its Consequences for Households

Danielle Venn

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EARNINGS VOLATILITY AND ITS CONSEQUENCES FOR HOUSEHOLDS

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SUMMARY

Many workers experience large fluctuations in before-tax labour earnings from one year to the next, due to changes in working hours, movements in and out of work and changes in pay. Youth entering the labour market and workers in non-standard jobs (such as temporary employment or self-employment) are the most likely to experience both large increases and large decreases in earnings. Other workers, such as those with a low level of education, poor health or approaching retirement, have only an increased chance of experiencing a large drop in earnings. It is often difficult for workers to predict changes in earnings and assess whether these are temporary or permanent. Additionally, private insurance and financial markets are poorly equipped to protect households against earnings fluctuations. Large drops in individual earnings are associated with an increased risk of household poverty and financial stress, with the impact largest in the poorest households. Tax and welfare systems can help buffer households against volatile earnings. Taxes play a prominent role in reducing the impact of earnings fluctuations among full-time workers, while transfers such as unemployment benefits and social assistance are more important when volatility is due to movements into or out of work.

RÉSUMÉ

De nombreux travailleurs connaissent d'importantes fluctuations de leurs gains liés au travail, avant impôts, d'une année à l'autre, en raison de variations de leur temps de travail, des flux d'entrée et de sortie de l'emploi et des variations de rémunération. Les jeunes qui entrent sur le marché du travail et les travailleurs qui occupent des emplois atypiques (emplois temporaires ou travail indépendant, par exemple) sont les plus susceptibles de connaître aussi bien de fortes augmentations que de fortes diminutions de leurs gains. Les autres travailleurs, par exemple ceux qui ont un faible niveau de formation, sont en mauvais santé ou approchent de la retraite ont uniquement une probabilité accrue de subir une forte diminution de leurs gains. Il est souvent difficile pour les travailleurs d'anticiper l'évolution de leurs gains et de savoir si les changements auront un caractère temporaire ou permanent. En outre, l'assurance privée et les marchés financiers sont mal équipés pour protéger les ménages contre les fluctuations de leurs gains. Les baisses importantes des gains individuels sont associées à un risque accru de pauvreté et de difficultés financières pour les ménages, en particulier pour les ménages les plus pauvres. Les systèmes fiscaux et de prestations peuvent contribuer à protéger les ménages contre la volatilité des gains. La fiscalité joue un rôle déterminant pour ce qui est de réduire l'impact des fluctuations des gains des travailleurs à plein temps, tandis que les transferts – tels que les allocations chômage et l'aide sociale – jouent un rôle plus important lorsque la volatilité des gains est due aux mouvements d'entrée et de sortie de l'emploi.

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EARNINGS VOLATILITY AND ITS CONSEQUENCES FOR HOUSEHOLDS

1. Introduction

1. Despite the importance to household welfare of income from the labour market, little attention has been paid to the extent to which labour market volatility translates into fluctuations over time in individual and household income. Workers' earnings might fluctuate across time due to the dynamic nature of modern labour markets that are characterised by the continuous reallocation of labour (OECD, 2009, 2010a). Even workers remaining in the same job may find their earnings vary substantially from one pay period to the next if, for example, they have irregular working hours or depend on commissions or bonus payments. Tax and transfer systems in OECD countries are designed to cushion households against large earnings shocks. However, if their success in sheltering households is limited, earnings volatility could result in insecurity and poverty risk for households, particularly for those without access to credit or savings to smooth consumption.

2. This paper presents, for the first time, comparable estimates of the incidence of individual earnings volatility for a large number of OECD countries, and describes the characteristics of those workers – and their jobs – that are most likely to experience large changes in earnings from one year to the next. The paper also examines the extent to which tax and benefit systems, and households themselves, provide a buffer against earnings volatility, and whether this volatility increases the risk of household poverty and financial stress.

3. This paper is organised as follows. Section 2 outlines the methodology used to measure earnings volatility. Section 3 presents cross-country estimates of the incidence of earnings volatility in OECD countries, and looks at trends over time in those countries for which long time-series of data are available. Section 4 examines the characteristics of workers who have volatile earnings. This analysis is complemented by looking at the types of jobs and firms that are most likely to involve the most volatile components of pay: overtime and performance pay. Section 5 discusses the consequences of earnings volatility for individuals and households, looking at the role of the tax and transfer system in buffering household income and at the impact of earnings volatility on the risk households face of poverty and financial stress. A short conclusion follows in Section 6.

2. Measuring earnings volatility

2.1 Alternative measures of earnings volatility

4. In their paper on the causes of growing US earnings inequality, Gottschalk and Moffitt (1994) pioneered an approach which distinguished between permanent earnings changes, due to factors such as skill-biased technical change, and transitory changes, which they termed earnings or income *instability*. This approach was very influential and inspired a large literature tracing the evolution of earnings instability over time. In general, estimating transitory changes in earnings requires complex econometric models and various assumptions about functional forms that can dramatically alter estimates, although later work by Gottschalk and Moffitt (2009) finds that simpler statistics based on variation from a long-run average provide a good approximation for transitory variation estimates obtained from more complex time-series models. Long time-series of data for individual earnings are also required. As a result, the existing literature focuses largely on the United States (where such datasets are readily available) and there are few cross-country estimates of earnings instability (an exception is Gangl, 2005).

5. Recently, a new strand of empirical studies focuses on earnings *volatility* or overall changes in earnings for individuals or households across time. In contrast to the complex time-series models used in

the earnings instability literature, this approach uses far simpler measures based on individual or cross-sectional variation in earnings. While it is not possible to distinguish between permanent and transitory variation in earnings using these approaches, several authors argue that overall measures of earnings volatility are in fact more useful because both permanent and transitory changes in earnings have the potential to impact on individual and household welfare (*e.g.* Shin and Solon, 2008; Dynan *et al.*, 2007). Of course, increased volatility is not necessarily an indicator of increased risk of adverse consequences; earnings changes may be the result of voluntary decisions by households. Even if earnings changes are involuntary, the extent to which they affect household welfare will depend on whether household consumption is buffered against earnings volatility by the tax and transfer system, insurance markets and the labour supply and savings responses of households themselves (this issue will be examined in more detail in section 5). Nevertheless, it is important to document the extent to which earnings fluctuate as a first step in understanding their impact on household welfare.

6. There are three main approaches to estimating earnings volatility, all of which require longitudinal data on earnings for individuals:

- Time-series methods (*e.g*. Hällsten *et al.*, 2010; McManus and DiPrete, 2000; Beach *et al.*, 2006): earnings volatility is calculated for each individual as the standard deviation of earnings or earnings changes over several consecutive periods (typically 5-8 years). An overall measure of earnings volatility for a country or sub-group is then calculated as the average of the individual standard deviations.

- Cross-sectional methods (*e.g.* Shin and Solon, 2007; Dynan *et al.*, 2007; Ziliak *et al.*, 2010): earnings volatility is measured as the cross-sectional variance or standard deviation of year—to—year earnings changes across individuals. The idea is that increases in earnings volatility should appear as an increased dispersion of year-to-year changes.

- Categorical methods (*e.g.* Congressional Budget Office, 2007; Dynan *et al.*, 2007): an individual is defined as having volatile earnings if they experience a large increase or decrease in real earnings from one year to the next. An overall measure of earnings volatility can then be calculated as the proportion of workers in a particular country or sub-group with volatile earnings.

7. Each of these approaches has advantages and disadvantages. Time-series methods are quite data—intensive as they require long time-series of individual data. Cross-sectional and categorical methods are less data-intensive but more open to measurement error because they are based only on year-to-year changes rather than changes over a longer period of time. Both time-series and categorical methods have the advantage of providing individual-level indicators of earnings volatility which can then be regressed against the personal or job characteristics of individuals to explain how earnings volatility varies by, for example, education level or age.

8. This paper will adopt the categorical method used by the US Congressional Budget Office (2007). Workers are said to have volatile earnings if their annual labour earnings increased by 20% or decreased by 20% in real terms from one year to the next. This approach has a number of advantages. First, it requires earnings data which are relatively easy to obtain for a large number of countries on a comparable basis. Second, because volatility is defined at the individual level (rather than as a summary measure for a whole country or sub-group of workers), it is possible to examine how personal and job characteristics affect its incidence. Third, volatility measures can be calculated using data from longitudinal surveys covering as few as two years rather than requiring long time-series of data, which expands the number of countries for which comparable earnings volatility measures can be calculated. On the other hand, using this method, it is impossible to distinguish between permanent and transitory earnings

changes, which may have important policy implications. The relatively short window over which estimates are constructed makes it difficult to distinguish between structural and cyclical influences on earnings volatility, given that different countries are likely to be at different points of their business cycles. This should be kept in mind when considering cross-country comparisons. Concentrating on year-to-year changes also risks overestimating the extent of earnings volatility by capturing one-off earnings changes or even measurement errors. The sensitivity of the results to the method adopted in this paper is examined in Section 3.3 by looking at alternative cross-sectional measures of earnings volatility and different thresholds for volatile earnings and by comparing year-to-year and multi-year measures of earnings volatility.

2.2 Data

9. The analysis in this paper uses household panel data for as many OECD countries as possible. The primary source is the European Union Survey of Income and Living Conditions (EU-SILC). This is supplemented with data from the Cross-National Equivalence Files (CNEF) of the Panel Study of Income Dynamics (PSID) for the United States, the German Socio-Economic Panel Survey (GSOEP) for Germany, the British Household Panel Survey (BHPS) for the United Kingdom and the Korean Labor and Income Panel Survey (KLIPS) for Korea.

10. The primary variable of interest is annual gross labour earnings, which includes positive self—employment income.[1] Percentage changes in earnings from one year to the next are calculated as an arc-percentage. That is, the percentage change in earnings is equal to earnings in one year minus earnings in the previous year, divided by the average of earnings for the two-year period. Nominal earnings changes are adjusted for inflation using annual consumer price inflation data from the OECD Main Economic Indicators database. A worker is defined as having volatile earnings if they have at least a 20% real increase or a 20% real decrease in gross labour earnings from one year to the next. Workers who have no gross labour earnings in either year examined are excluded from the analysis.

11. Some of the analysis is restricted to a sample including workers who were employed full-time for the full-year in both years that are used to calculate earnings volatility. In the EU-SILC, full-time full-year employment is defined as having been in full-time employment for 12 months of the income reference year, based on the calendar information collected in the survey. For respondents where the calendar was incomplete, full-time full-year employment is identified as having been in full-time employment for all of the months for which calendar data are available, however, respondents with less than 10 months of calendar data were excluded from the full-time full-year sample (but are included in the overall sample). In the CNEF sample, full-time full-year employment is defined as those who worked more than 35 hours per week on average in the income reference year.[2]

3. Individual earnings volatility

3.1. Earnings volatility in OECD countries

12. Figure 1 shows the incidence of earnings volatility in OECD countries for which data are available. The estimates shown are for workers aged between 25 and 59 years to minimise the possibility that the results are driven by young people entering the labour market and older workers transitioning into retirement (earnings volatility for youth and older workers will be examined in Section 4). Overall earnings volatility is highest in Austria, Hungary, Korea, Portugal and Spain, which all have a high incidence of

1 . Because of inconsistent treatment of self-employment losses across countries in the EU-SILC, any losses are set equal to zero.

2 . The cut-off of 35 hours for full-time work is set by the compilers of the CNEF data set. It differs from the standard OECD definition of part-time work which uses a cut-off of 30 hours per week.

both large increases and large decreases. In addition, a large proportion of workers in the Czech Republic, the Slovak Republic and Poland receive large increases in earnings, while large decreases are relatively common in Ireland. Excluding the Czech Republic, the Slovak Republic and Poland, which experienced annual GDP growth in excess of 6% during the period under examination, there is a high degree of symmetry between increases and decreases in earnings: countries with a large proportion of workers receiving an increase in earnings also tend to have a large proportion of workers receiving a decrease in earnings.[3] However, in all countries, large decreases in earnings are less common than large increases.

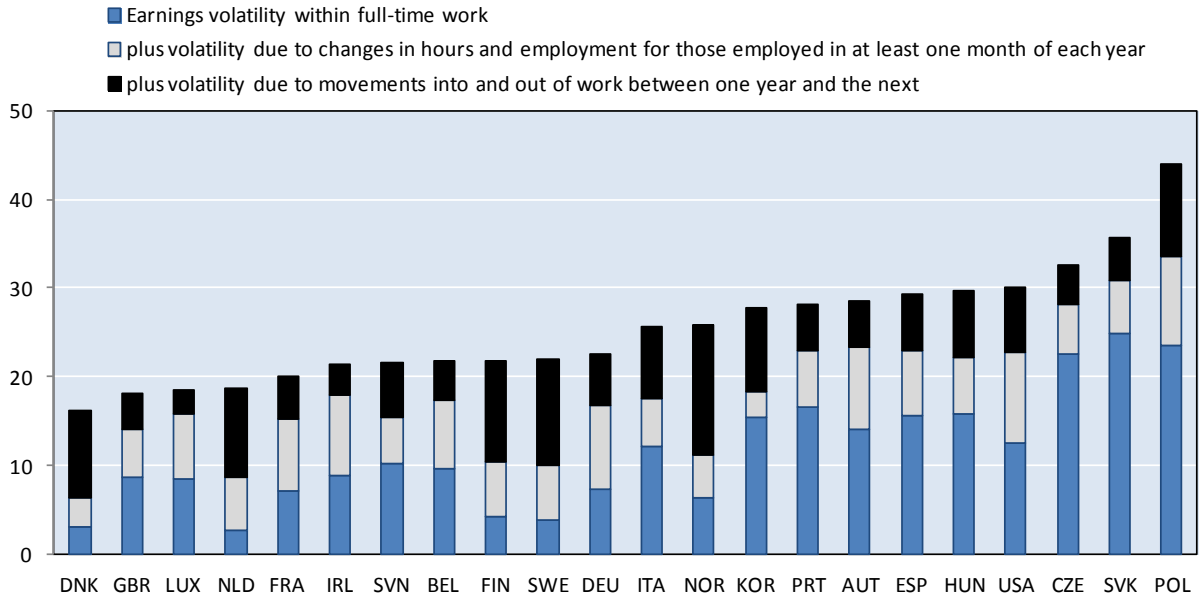
13. In-work earnings volatility is largely driven by changes within the same job (Figure 2). With the exception of Slovenia and Poland, very little earnings volatility among those who remained employed for two full years was the result of changing jobs. This is likely because the incidence of job changes is quite small (less than 15%) among those who remain employed. Changes in earnings in the same job could result from changes to working hours, basic wages or additional pay such as overtime or bonus payments (as well as measurement error). However, it is not possible using annual earnings data to distinguish between these different sources of earnings volatility.

14. For the remainder of this paper, the analysis will focus on two main types of earnings volatility: (i) *full-time earnings volatility* which refers to earnings volatility among workers who were employed full—time for the full year in both years (not necessarily in the same job) for which earnings volatility is calculated; and (ii) *overall earnings volatility* which refers to earnings volatility among all workers who worked at least some time in one of the two years for which earnings volatility is calculated.

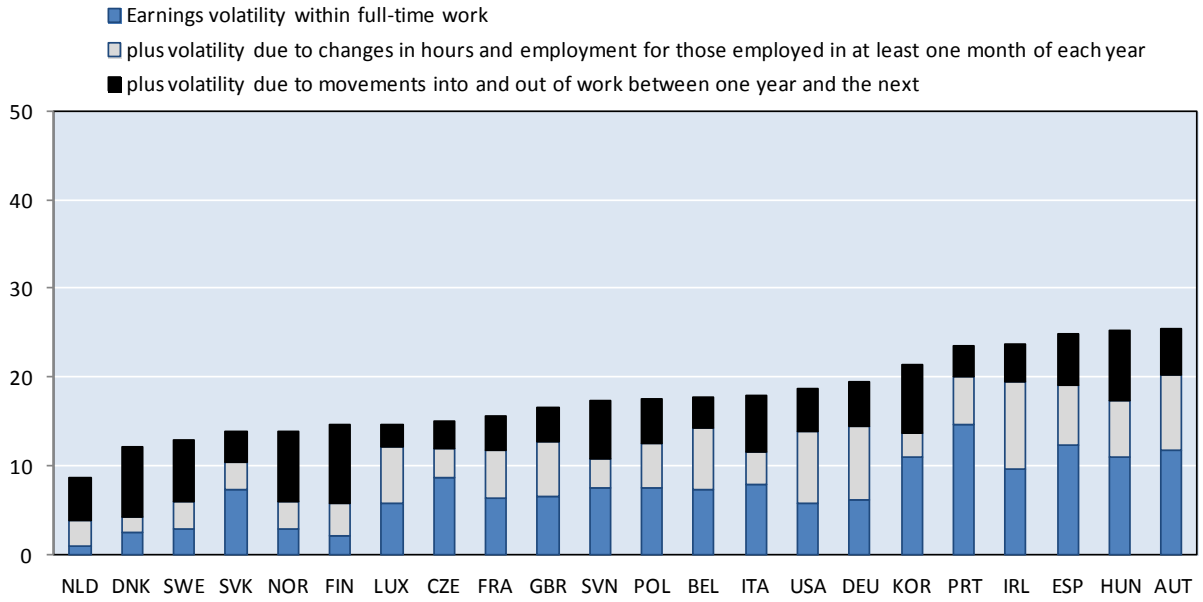
3 . Excluding the Czech Republic, Poland and the Slovak Republic, the cross-country correlation between the incidence of large increases and the incidence of large decreases is 79% for workers who were employed full-time for the full year and 71% for all workers (both correlations are significant at 99% level).

Figure 1. **Incidence of year-to-year gross labour earnings volatility**

A. Proportion of workers experiencing 20% real increase in gross earnings



B. Proportion of workers experiencing 20% real decrease in gross earnings

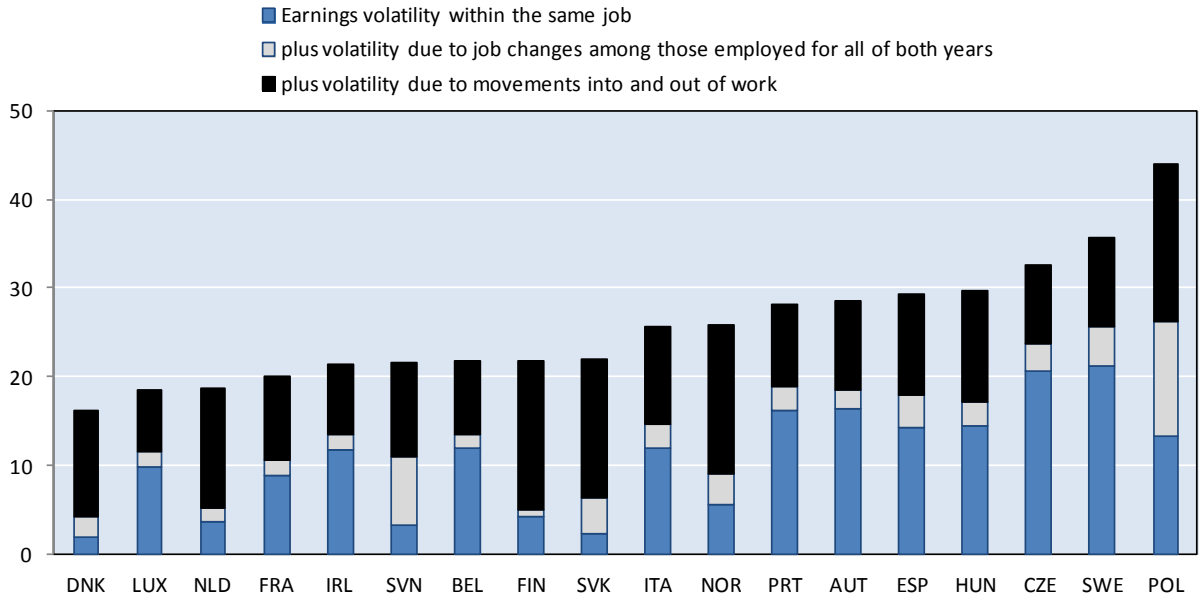


Note: Data are for the income reference years 2004-2007 for all countries except Italy and Portugal (2006-2007), France (2005-2006), Denmark (2004-2005) and United States (1995-1996). Estimates are as a proportion of all workers who worked at least some time in at least one of the two years for which the estimates are made.

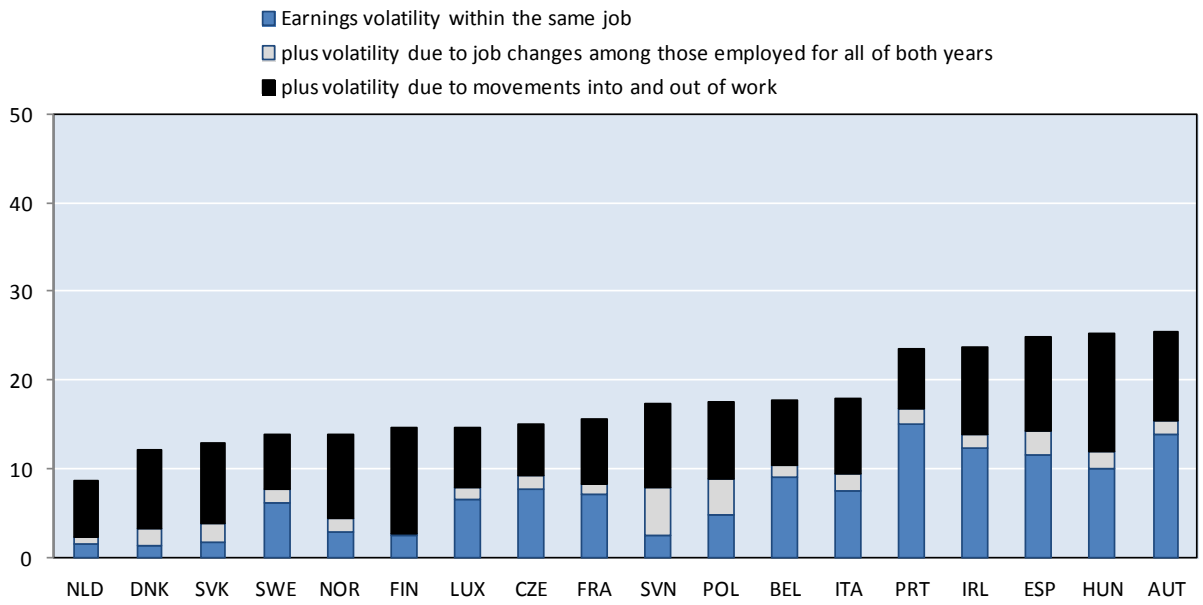
Source: Author's calculations using data from the European Survey of Income and Labour Conditions (EU-SILC) except for Germany, Korea, United Kingdom and United States, which are from the Cross-National Equivalence Files of the German Socio-Economic Panel, Korean Labor and Income Panel Survey, British Household Panel Survey and the Panel Study of Income Dynamics, respectively.

Figure 2. **Incidence of year-to-year gross labour earnings volatility, by whether or not changed job**

A. Proportion of workers experiencing 20% real increase in gross earnings



B. Proportion of workers experiencing 20% real decrease in gross earnings



Note: Data are for the income reference years 2004-2007 for all countries except Italy and Portugal (2006-2007), France (2005-2006) and Denmark (2004-2005). Estimates are as a proportion of all workers who worked at least some time in at least one of the two years for which the estimates are made.

Source: Author's calculations using data from the European Survey of Income and Labour Conditions (EU-SILC).

3.2. Trends in earnings volatility

15. Sufficient data to calculate trends in earnings volatility are available for only a small number of OECD countries. Figure 3 shows that there is no clear cross-country trend in earnings volatility.[4] Overall, the incidence of full-time earnings volatility has increased over time in the United States and Germany and declined in Korea. In the United Kingdom, recent levels of earnings volatility are much the same as those in the early 1990s, following a large increase in volatility in the late 1990s and early 2000s which was probably due to the introduction of the minimum wage in April 1999.[5] Overall earnings volatility (including volatility associated with movements into and out of work) has declined in Korea and the United Kingdom since the early 2000s. Overall volatility increased in Germany from the early to mid-2000s and then fell slightly. While overall volatility was relatively stable in the United States between the mid-1970s and mid-1990s, there were sharp gender differences: volatility rose for men but declined for women as many more women entered the workforce or moved from part-time to full-time work. Data for more recent years in the United States suggest that earnings volatility may have increased again since the late 1990s, at least for men (see Box 1 and research by Dynan *et al.*, 2007; Shin and Solon, 2008; Ziliak *et al.*, 2010).

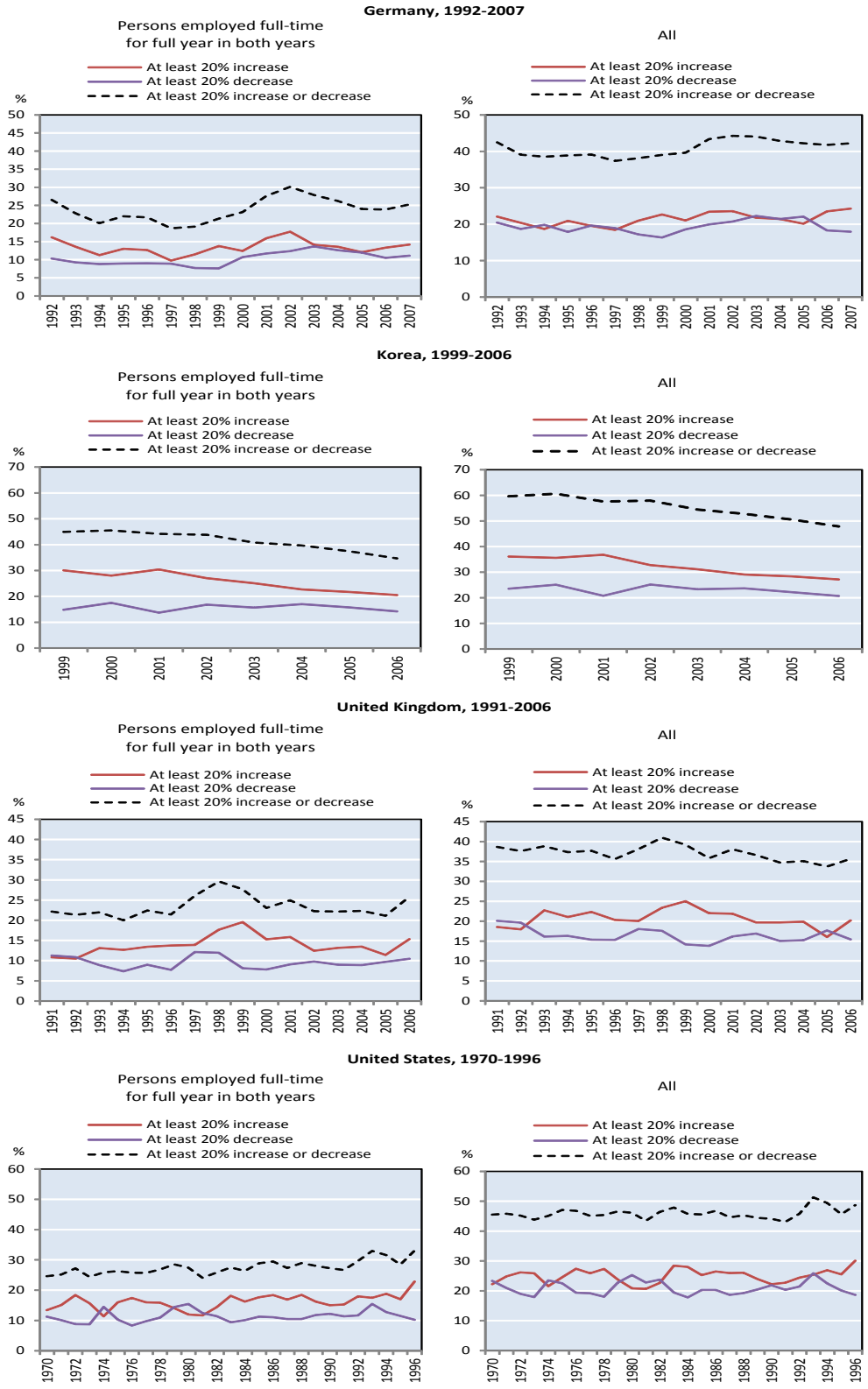
16. Figure 3 also shows that the business cycle has a major impact on earnings volatility. A period of increasing unemployment is typically accompanied by a greater number of large decreases in earnings and fewer large increases, due to greater fluctuations in the earnings of full-time workers, more labour market exits and fewer entries. In the United States, this pattern can be seen in the downturns of the mid-1970s, early 1980s and early 1990s (although there were actually more large increases in earnings for full-time workers during the latter period). Likewise, in the United Kingdom between 2004 and 2006 and in Korea in 2003, a higher incidence of large decreases and lower incidence of large decreases can be observed at a time when unemployment was rising. The exception is Germany, where a rising unemployment rate during the mid-1990s and from 2001 to 2005 was accompanied by an increase in the incidence of both large decreases and large increases in earnings.

17. These results suggest that the business cycle is a significant contributor to individual earnings volatility, but that the extent of its influence varies across countries, possibly due to country-specific policy or institutional settings. A more detailed exanimation of the influence of the business cycle and of policies and institutions on earnings volatility is not possible using the data available because there are too few countries for which long time-series of data are available. Therefore, in their complementary analysis, OECD (2011) and Bassanini (2011) use aggregate and industry-level data to examine this issue and find that output shocks result in proportionately larger shocks to total earnings, with the impact primarily due to employment and hours effects. In countries with less generous unemployment benefits, lower tax wedges and higher employment protection for regular workers, output shocks have a smaller impact on fluctuations in total earnings.

4 . The trends in Figure 3 are qualitatively similar if an alternative measure of earnings volatility using the cross-sectional standard deviation of real changes in earnings is used. The cross-country divergence in earnings volatility trends is also echoed in the findings of other researchers. Hällsten *et al.*, (2010) find that earnings volatility increased in Sweden between 1985 and 2003, while Beach *et al.*, (2006) show overall volatility in Canada was relatively stable over a similar period (although it tended to increase for men and decrease for women).

5 . British workers in the lowest earnings quintile were disproportionately likely to have experienced a large increase in earnings in the two years following the introduction of the minimum wage.

Figure 3. **Trends in earnings volatility over different time periods in selected OECD countries**



Source: OECD calculations using CNEF data described in the note to Figure 1.

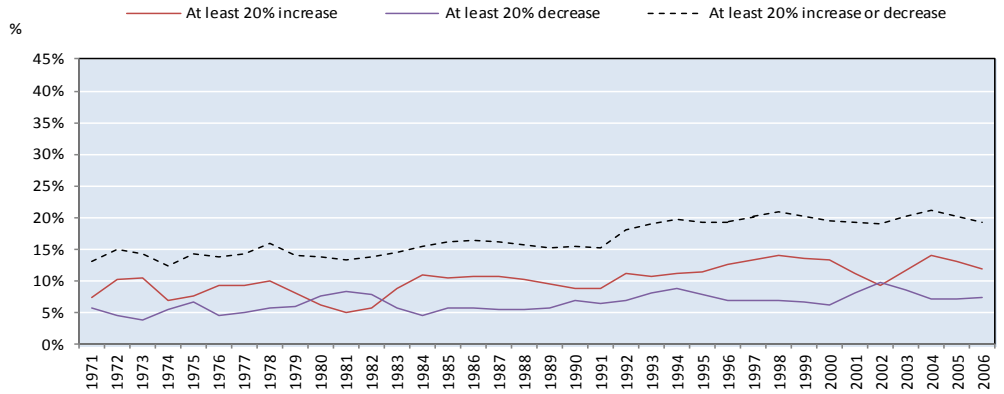
Box 1. **Recent estimates of earnings volatility for the United States**

Estimates of earnings volatility for the United States in Figure 3 use data from the Cross-National Equivalence File version of the Panel Survey of Income Dynamics (PSID). After 1997, the PSID was conducted only every two years, so year-to-year earnings measures for the United States are not available after income reference year 1996. It is possible to reconstruct measures of earnings volatility using a three-year rather than a two-year window to examine more recent trends in earnings volatility.

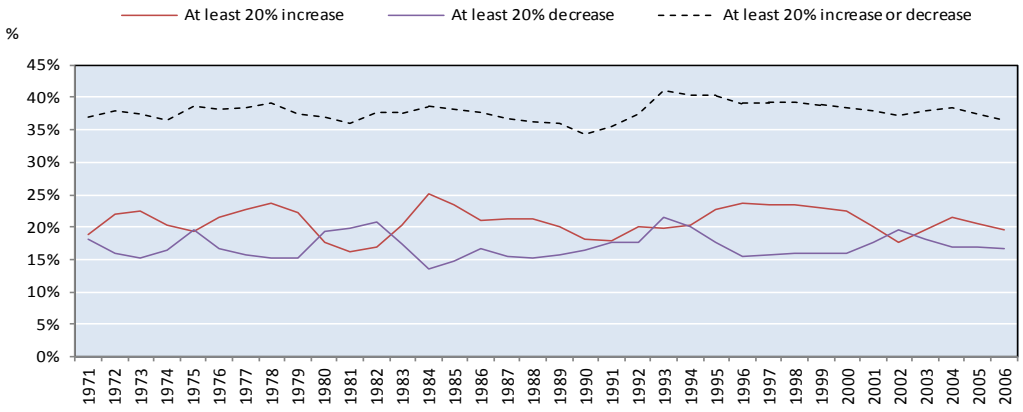
Earnings volatility is then defined as the proportion of workers having at least a 20% increase or a 20% decrease in gross labour earnings between two years which are one year apart. For example, earnings volatility measures for 2006 are constructed using data on earnings changes between 2006 and 2004. Workers who move out of work are assigned a reduction of at least 20%, while workers who move from inactivity or unemployment into work are assigned an increase of at least 20%. The figure below shows trends in earnings volatility using the new three-year measures. There has been little change in full-time earnings volatility since the mid-1990s, but overall earnings volatility has tended to fall in recent years.

Trends in earnings volatility in the United States using a three-year window for annual earnings

A. Full-time earnings volatility (for individuals who were employed full-time in t-2 and t)



B. Overall earnings volatility



Source: Author's calculations using data from the CNEF of the PSID.

3.3. Sensitivity of earnings volatility estimates to methodology

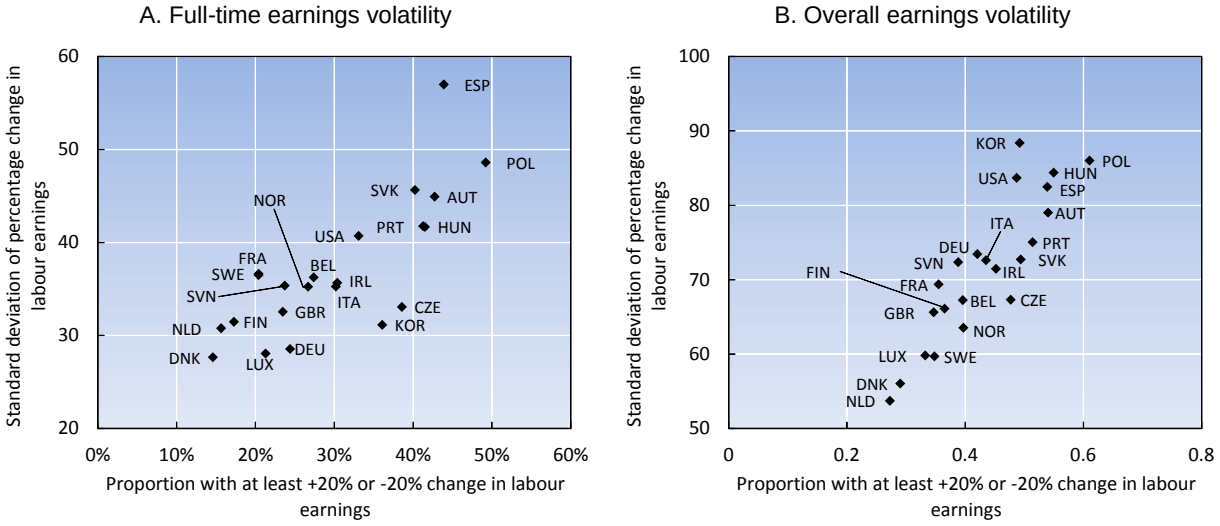
18. The choice of 20% as the threshold for earnings volatility is somewhat arbitrary but the broad results presented in the paper are not dependent on this choice. The ranking of countries based on the incidence of earnings volatility using alternative thresholds (5%, 10%, 20% and 50%) are highly correlated. In all cases, the rank correlation with measures using the 20% threshold is greater than 75% and, in most cases, it exceeds 90% (Table 1). Likewise, country rankings are largely similar if a cross-sectional method, rather than a categorical method, is used to estimate the incidence of earnings volatility. Figure 4 compares estimates of full-time and overall earnings volatility using the 20% threshold used in Section 3.1 with estimates equal to the cross-sectional standard deviation of year-to-year earnings changes, a commonly used measure of earnings volatility.[6]

Table 1. **Rank correlations for different earnings volatility thresholds**

	Real increase of 20% in real earnings correlated with :			Real decrease of 20% in real earnings correlated with :		
	Real increase of 5% in gross earnings	Real increase of 10% in gross earnings	Real increase of 50% in gross earnings	Real decrease of 5% in gross earnings	Real decrease of 10% in gross earnings	Real decrease of 50% in gross earnings
FT employed in all months of both years	0.79	0.94	0.94	0.84	0.94	0.81
Employed in all months of both years	0.76	0.90	0.90	0.92	0.95	0.90
Employed in at least one month of each year	0.83	0.92	0.83	0.91	0.96	0.78
All	0.77	0.90	0.84	0.88	0.93	0.91

Source: Author's calculations using data described in note to Figure 1.

Figure 4. **Earnings volatility using alternative measures**



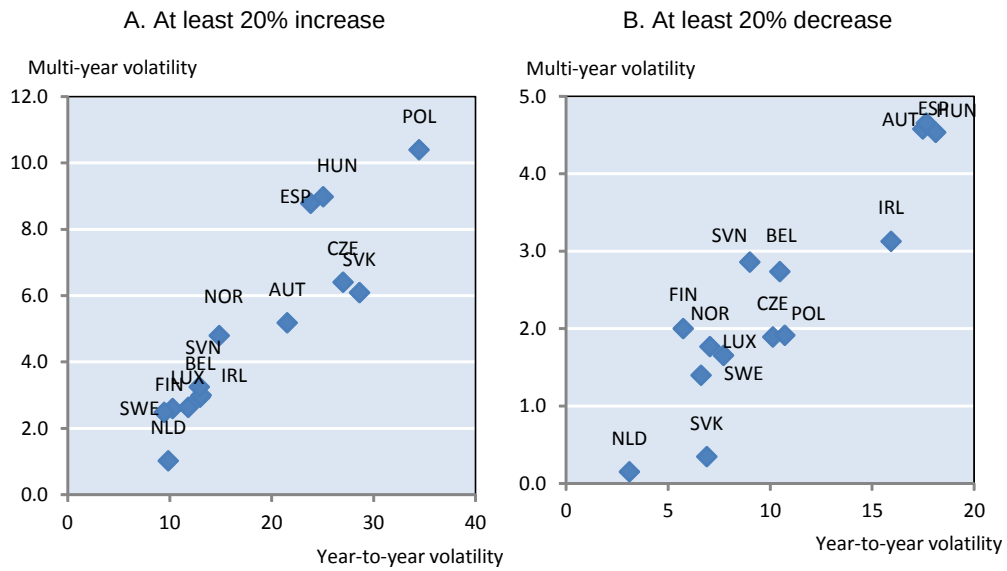
Source: Author's calculations using data described in note to Figure 1.

6 . Year-to-year earnings changes are calculated as the arc-percentage as discussed in Section 2.2. This means that earnings changes for those moving into work are equal to 200% and those moving out of work to -200%.

19. Finally, country rankings using estimates of earnings volatility based on year-to-year changes in earnings are similar to those using multi-year measures of earnings volatility, among the sample of workers for whom data on earnings volatility are available for three consecutive years. Multi-year earnings volatility is defined as having either a 20% increase or 20% decrease in annual labour earnings from one year to the next for three consecutive years. Workers with multi-year earnings volatility are classified as having a multi-year increase in earnings if they have a 20% increase in earnings in at least two of the three years and as having a multi-year decrease in earnings if they have a 20% decrease in at least two of the three years.

20. There is a high degree of correlation between year-to-year earnings volatility and multi-year earnings volatility (Figure 5). The countries with high year-to-year full-time earnings volatility also tend to have high multi-year full-time earnings volatility. However, the incidence of multi-year earning volatility is about three to four times smaller than that of year-to-year earnings volatility. Insofar as multi-year earnings volatility is less affected by measurement error, the patterns in Figure 5 suggest that measures of year-to-year earnings volatility used elsewhere in this paper are a sufficiently-reliable indicator of the relative incidence of earnings volatility.

Figure 5. **Year-to-year and multi-year full-time earnings volatility are highly correlated**



Source: Author's calculations using EU-SILC data described in the note to Figure 1. Not all countries shown because gross earnings data are not available in every year.

4. Who has volatile earnings?

4.1 Effects of personal and job characteristics on earnings volatility

21. As a first step to understanding the impact of earnings volatility on households, it is important to know what types of workers are particularly vulnerable to having volatile earnings. Pooled (across countries) multinomial logit models are used to examine the impact of personal and job characteristics on the probability of both year-to-year and multi-year earnings volatility. For year-to-year earnings volatility, the dependent variable is a 5-category variable based on the real change in gross labour earnings from one year to the next:

- 20% or more increase in earnings;
- 5% to less than 20% increase in earnings;
- less than 5% decrease to less than 5% increase in earnings;
- 5% to less than 20% decrease in earnings; and
- 20% or more decrease in earnings.

For multi-year earnings volatility, the dependent variable is a 3-category variable based on the real change in gross labour earnings from one year to the next over three consecutive years:

- 20% or more increase in earnings in all three years, or in at least two out of three years and 20% or more decrease in the other year;
- 20% or more decrease in earnings in all three years, or in at least two out of three years and 20% or more increase in the other year; and
- fewer than three years with at least a 20% increase or 20% decrease in earnings.

22. In terms of personal characteristics, the models gender, age, education and health status (equal to one if the respondent says that their current state of health is 'bad' or 'very bad') as explanatory variables. In terms of job characteristics, there are variables for employment status and occupation. Employment status (temporary contract or self-employed) in the multi-year model is equal to one if the respondent was employed on a temporary contract or self-employed in any of the four years examined and zero otherwise. The other variables in the multi-year model refer to the situation in the first year examined (for demographic characteristics) or to the first year of employment (for job characteristics). In addition, there are controls for country and year. A control is also included for income quartile to control for the possibility that some earnings volatility reflects reversion to the mean. This appears to be the case for year—to-year changes: workers with lower earnings tend to have more earnings increases and those with higher earnings have more decreases. This suggests some degree of measurement error in the underlying income data. In this case, estimates of earnings volatility based on year-to-year changes will overestimate the true incidence of earnings volatility. It is reassuring, however, that after controlling for the earnings quartile, the results for other characteristics are largely unchanged and can be largely replicated on multi-year earnings volatility.

23. Tables 2 and 3 show the results of the regression analysis. All other things equal:

- Men are more likely than women to experience large year-to-year increases in earnings, while the opposite is true for large decreases in earnings.[7] This pattern persist both within full-time work and when movements into and out of work are taken into account, however there is little gender difference in the incidence of multi-year earnings volatility.

- Young workers experience substantially more year-to-year earnings volatility – both increases and decreases – than prime-age workers. The effect is largest for those aged under 25 years, but persists into the late 20s and early 30s. This may reflect the impact of work experience and tenure in stabilising employment, but also the process of job search that younger workers undertake

7 . Looking at the average incidence of earnings volatility for men and women (without controlling for job and personal characteristics) shows that, while men are more likely than women to have volatile year-to-year earnings within full-time work, women are more likely to move into and out of work and from full-time to part-time jobs and so have greater overall earnings volatility. This is not evident once job characteristics are taken into account because women are concentrated in jobs that have greater volatility. Notably, women are more likely than men on average to hold temporary jobs.

when joining the workforce.[8] *Successive* large increases in earnings are still more likely for younger workers, but large decreases in earnings over multiple years are only significantly more likely among older workers transitioning to retirement. However, there is no evidence that older workers experience more earnings volatility within full-time jobs than prime-age workers.

- Less-educated workers are more likely to experience a large decrease in year-to-year earnings and less likely to experience a large increase than more educated workers, however there is little difference in the probability of multi-year earnings volatility by education level.

- Workers with health problems (who say that their current state of health is 'bad' or 'very bad') are significantly more likely to have earnings decreases, both year-to-year and across multiple years. This is consistent with people with health problems pulling out of work or reducing their availability to work overtime if they work full-time.[9] On the other hand, workers with health problems are less likely to have year-to-year earnings increases in full-time jobs.

- Workers in 'non-standard' employment are far more likely to experience earnings volatility than employees with permanent contracts. Temporary employees and the self-employed are more likely to have both large increases and large decreases in earnings within full-time work than permanent employees, and this holds for year-to-year and multi-year earnings volatility. For temporary employees, the earnings volatility gap with permanent employees grows even larger when movements into and out of work are taken into account. For the self-employed, most decreases in earnings results from decreases within full-time work, both on a year-to-year and multi-year basis. In contrast, multi-year earnings increases for the self-employed are driven mainly by labour market entry.

24. The data used to examine the impact of individual and job characteristics on the likelihood of earnings volatility are somewhat lacking in detail on job characteristics. Notably, there are no data on industry or firm characteristics in the longitudinal version of the EU-SILC survey. In order to examine in more detail the job and firm characteristics associated with earnings volatility, the next section will use different data sources (with better information on job and firm characteristics) to examine how personal, job and firm characteristics affect the incidence of overtime and performance pay, which tend to be the most volatile components of earnings.

8 . Data on work experience are not available for all countries. Models run on a reduced sample including a control for experience show that less-experienced workers have more earnings volatility, but younger workers are still significantly more likely than prime-age workers to have volatile earnings.

9 . The results are similar if health problems are defined using alternative variables such as self-defined chronic health problems or if workers say that they have a health problem that limits their activities. These alternative variables are not used in the main analysis shown in Tables 2 and 3 because they are missing for a large proportion of respondents from some countries. The results for year-to-year earnings increases shown in Table 2 are not found using these alternative measures, but those for multi-year earnings increases using the alternative measures are the same as in Table 3.

Table 2. **Effect of personal and job characteristics on the likelihood of year-to-year earnings volatility**

Estimated marginal effects (change in probability in percentage points) from multinomial logit models (base category is having -5% to +5% change in earnings)

		Full-time earnings volatility		Overall earnings volatility	
		At least 20% increase	**At least 20% decrease**	**At least 20% increase**	**At least 20% decrease**
Gender	Female	-3.2 ***	2.0 *	-6.2 ***	3.8 ***
	Male (base)	..	..	..	..
Age	15-24 (base)	..	..	..	..
	25-34	-5.4 ***	-0.9 ***	-6.4 ***	-1.4 ***
	35-44	-6.5 ***	-3.1 ***	-8.9 ***	-4.4 ***
	45-54	-7.0 ***	-3.8 ***	-10.4 ***	-6.0 ***
	55+	-8.0 ***	-2.3 ***	-15.2 ***	4.5 *
Poor health		-2.5 **	6.3 ***	-4.9	14.1 ***
Education	Below secondary (base)	..	..	..	..
	Secondary	1.7	-2.3 ***	2.0 ***	-1.6 ***
	Post-secondary	3.4 ***	-2.9 **	3.0 ***	-2.4
	Tertiary	6.5 ***	-4.4 ***	8.1 ***	-4.5 ***
Employment status	Self-employed	14.5 ***	23.7 ***	8.6 ***	25.4 ***
	Permanent employee (base)	..	..	..	..
	Temporary employee	1.8 ***	5.3 ***	2.7 ***	14.4 ***
Income quartile	Lowest (base)	..	..	..	..
	Second	-17.6 ***	1.7	-34.0 ***	1.1 ***
	Third	-24.6 ***	5.2 ***	-45.6 ***	1.6 ***
	Highest	-28.4 ***	14.9 ***	-50.3 ***	10.0 **
Occupation dummies		Yes	Yes	Yes	Yes
Country dummies		Yes	Yes	Yes	Yes
Time dummies		Yes	Yes	Yes	Yes
Observations		**120578**	**120578**	**146301**	**146301**
Pseudo R-squared		**0.0870**	**0.0870**	**0.0969**	**0.0969**

Note: Estimated coefficients from a multinomial logit model where the dependent variable is a three-category indicator of individual gross labour earnings volatility over a three year period: at least 20% increase in earnings in at least two years and 20% decrease in the other year; increase or decrease of less than 20% in at least one of the three years; at least 20% decrease in earnings in at least two years and 20% increase in the other year. Marginal effect for a categorical variable is calculated as the percentage point change in the probability of earnings volatility when moving from zero to one or from the base-category to the specified category. ***, ** and * indicate that underlying coefficients are significantly different from zero at the 99%, 95% and 90% level, respectively. Robust standard-errors are adjusted for clustering at the country-level. Estimates are weighted so that the effects represent the cross-country average effect.

Source: Author's calculations using data from EU-SILC for income reference years 2004 to 2007.

Table 3. **Effect of personal and job characteristics on the likelihood of multi-year earnings volatility**

Estimated marginal effects (change in probability in percentage points) from multinomial logit models (base category is not having at least 20% increase or decrease in earnings in at least one year)

		Full-time earnings volatility		Overall earnings volatility	
		At least 20% increase	At least 20% decrease	At least 20% increase	At least 20% decrease
Gender	Female	0.5	-0.6 ***	0.0	-0.8
	Male (base)	..	..	..	..
Age	15-24 (base)	..	..	..	..
	25-34	-7.4 **	0.8	-17.5 ***	1.4
	35-44	-9.0 ***	-0.4	-22.9 ***	0.7
	45-54	-9.1 **	-0.2	-25.2 ***	0.3 ***
	55+	-9.9 ***	0.1	-26.6 ***	5.3 ***
Poor health		-0.1	1.4 ***	0.7	4.0 ***
Education	Below secondary (base)	..	..	..	..
	Secondary	-0.7	-0.6	-0.3	-1.6 ***
	Post-secondary	-2.7 **	0.1	-1.8 **	-0.2
	Tertiary	-1.0	-0.4	2.6 **	-0.5
Self-employed		16.6 ***	10.9 ***	19.8 ***	10.3 ***
Temporary contract		1.7 **	0.8	11.0 ***	3.0 ***
Income quartile	Lowest (base)	..	..	..	..
	Second	1.2	-0.8	-8.7 ***	-12.7 ***
	Third	0.5	-1.2	-12.5 ***	-17.0 ***
	Highest	3.5 ***	-1.8 *	-12.1 ***	-17.8 ***
Occupation dummies		Yes	Yes	Yes	Yes
Country dummies		Yes	Yes	Yes	Yes
Time dummies		Yes	Yes	Yes	Yes
Observations		**13608**	**13608**	**24178**	**24178**
Pseudo R-squared		**0.1459**	**0.1459**	**0.1588**	**0.1588**

Note: Estimated coefficients from a multinomial logit model where the dependent variable is a three-category indicator of individual gross labour earnings volatility over a three year period: at least 20% increase in earnings in at least two years and 20% decrease in the other year; increase or decrease of less than 20% in at least one of the three years; at least 20% decrease in earnings in at least two years and 20% increase in the other year. Marginal effect for a categorical variable is calculated as the percentage point change in the probability of earnings volatility when moving from zero to one or from the base-category to the specified category. ***, ** and * indicate that coefficients are significantly different from zero at the 99%, 95% and 90% level, respectively. Robust standard-errors are adjusted for clustering at the country-level. Estimates are weighted so that the effects represent the cross-country average effect.

Source: Author's calculations using data from EU-SILC for income reference years 2004 to 2007.

4.2 A closer look at the most volatile components of earnings: overtime and performance pay

25. Labour earnings include basic rates of pay and additional components such as paid overtime, bonuses, commissions and shift loadings. Several studies find that total earnings, including overtime and additional payments such as bonus pay, are more pro-cyclical than basic earnings, increasing when economic conditions are good and falling in downturns (*e.g.* Anger, 2010, for Germany; Urasawa, 2010, for Japan; Devereux, 2001, Swanson, 2007, and Shin and Solon, 2007, for the United States).[10] This suggests that these additional payments

10 . Evidence on the cyclicality of total earnings for the United Kingdom is mixed. Hart (2003) and Devereux and Hart (2006) find little difference in the cyclicality of basic hourly wage rates and total hourly wage rates. However, Peng and Seibert (2007) generate estimates of the elasticity of total wages to the business cycle higher than those of Devereux and Hart (2006) and suggest that this deviation may be due to higher cyclicality of overtime and bonus pay. Likewise, evidence for Portugal suggests that overtime does not

are more volatile over the business cycle than basic rates of pay in many countries. It is therefore reasonable to assume that working in a job with overtime or performance pay might increase the likelihood of earnings volatility for workers, so factors that affect the incidence of overtime or performance pay may also affect the incidence of earnings volatility. Unfortunately, it is not possible to test directly for a link between earnings volatility and the incidence of overtime or performance pay. Data on the incidence of overtime and performance pay used in this paper do not contain detailed information on workers' earnings, or on changes in earnings over time. Likewise, data used in this paper to calculate the incidence of earnings volatility do not contain information about performance pay or overtime.

26. The observed incidence of paid overtime and performance pay is the result of decisions made by firms and workers (for comprehensive surveys of the theoretical and empirical literature see Prendergast, 1999, for performance pay and Hart, 2004, for overtime). Firms' decisions to use paid overtime will be influenced, among other things, by regulation set through legislation or collective bargaining and covering issues such as penalty rates for overtime and explicit limits on overtime hours (see OECD, 2010b, for a detailed description of working time regulations in OECD countries). Firms that need to adjust to daily, weekly or seasonal changes in demand for their products or services might use overtime if it is cheaper and more rapidly adjustable than hiring or firing workers. Asking existing workers to work overtime may also be useful for firms that face steep hiring costs or where workers (or particular skills) are in short supply. Unlike overtime, firms' use of performance pay is rarely regulated in legislation, although it may form part of collective bargaining agreements. Firms will be more likely to use performance pay schemes when other, often cheaper, incentive mechanisms – such as motivating workers through future promotion opportunities or efficiency wages – do not elicit good performance. The nature of job tasks may also affect the type of incentives used by firms. As the cost of monitoring performance rises, firms may be more likely to use performance pay based on output. However, if individual workers' output is difficult to measure, team- or firm-based performance pay may be more effective than individual bonuses or piece rates.

27. Workers' incentives to work paid overtime or take part in performance pay schemes are also likely to influence their incidence. Workers with characteristics that make them likely to perform well (or to appear to perform well given the type of performance pay system on offer) will be more likely to choose a job where performance pay is available. The reverse is also true. For example, women's disproportionate share of household work may leave them less time to devote to meeting performance goals at work, so they may be less likely to choose jobs with performance pay. Family responsibilities or other commitments outside work might also leave workers with less time to work overtime. In addition, workers may be attracted to paid overtime by the higher hourly wage rates on offer or the opportunity for higher total earnings from working longer hours.[11]

28. Data from the European Company Survey (2009) and European Survey of Working Conditions (2005) include information for many European OECD member countries on the use of paid overtime and four types of performance pay – individual bonuses, commission and piece rates; team-based bonus payments; profit-sharing arrangements; and share ownership schemes. They also include more detailed information on job and establishment/firm characteristics than are available in the data used to estimate the incidence of earnings volatility in the previous section. Table 4 shows the results of probit models for employees, where the dependent variable is equal to one if the employee received paid overtime

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increase the cyclicality of hourly wages, possibly due to a relatively low incidence of overtime in that country (Carneiro and Portugal, 2004).

11. The decision by workers to work unpaid overtime is, on the face of it, more puzzling. However, there is growing evidence that unpaid overtime may be compensated by higher basic wage rates, improved chances of future promotion or wage increases and even greater job security (Anger, 2005; Cherry, 2003; DeRiviere, 2008; Takahashi, 2006; Pannenberg, 2002; Campbell and Green, 2002; Booth *et al*., 2002).

or each type of performance pay and zero otherwise. The results shown are the marginal increase or decrease in the probability of having each type of pay, in percentage points.

Table 4. **Effect of characteristics on the likelihood of having paid overtime and performance pay**

Estimated marginal effects from a probit model using employee data

		Paid overtime	Individual performance pay	Profit-sharing	Team-based bonuses	Share ownership schemes
Gender and family	Women with children under 15	-6.1 ***	-2.8 **	-3.7 ***	-2.4 ***	-0.6 **
	Women <45 years without children	-7.1 ***	-4.1 ***	-3.7 ***	-1.8 ***	-1.0 ***
	Women 45+ years without children	-7.5 ***	-2.3	-2.9 **	-1.0	-0.5
	Men (base)	..	..	..	..	..
Age	15-24 (base)	..	..	..	..	..
	25-34	-1.2	1.4	3.6 **	0.6	0.4
	35-44	-1.4	3.2 **	4.1 ***	1.0	0.3
	45-54	-6.6 **	1.2	1.2	-1.2	-0.1
	55+	-11.1 ***	0.6	1.6	-1.4	0.7
Work experience		0.0	-0.1 **	0.0	0.0	0.0
Job tenure		0.0	0.1 **	0.1 **	0.1 ***	0.0 ***
Education	Below secondary (base)	..	..	..	..	..
	Secondary	-0.9	2.0 *	1.4	0.9	0.2
	Post-secondary	-0.7	-0.3	1.2	1.1	0.8 *
	Tertiary	-10.0 ***	-1.0	4.9 ***	3.8 ***	1.1 ***
Fixed-term contract		-0.2	0.2	-3.4 ***	-0.4	-0.2
Temporary agency worker		5.8	1.0	-7.5 ***	-3.5 *	-0.8
Part-timer		-3.6 **	0.5	-3.0 ***	-1.5 **	0.5
Firm size	Less than 10 employees (base)	..	..	..	..	..
	10-49 employees	7.9 ***	1.6 *	1.4 *	0.6	0.2
	50-249 employees	9.5 ***	3.6 ***	4.0 ***	3.0 ***	1.0 ***
	250+ employees	7.3 ***	4.0 ***	8.2 ***	4.3 ***	2.8 ***
Promotion is likely		2.5 *	2.2 **	2.8 ***	2.3 ***	0.6 ***
Job involves:	Dealing with unforeseen problems	2.9 *	-1.3	4.2 ***	1.9 ***	0.5 *
	Complex tasks	0.8	0.0	2.0 ***	0.9 *	0.5 **
Occupation dummies		Yes	Yes	Yes	Yes	Yes
Industry dummies		Yes	Yes	Yes	Yes	Yes
Country dummies		Yes	Yes	Yes	Yes	Yes
Observations		**10516**	**10486**	**10442**	**10421**	**10424**
Pseudo R-squared		**0.0992**	**0.1240**	**0.2030**	**0.1856**	**0.2237**

Note: ***, ** and * indicate that coefficients are significantly different from zero at the 99%, 95% and 90% level, respectively. Robust standard-errors are adjusted for clustering at the country-level. Estimates are weighted so that the effects represent the cross-country average effect. Sample includes employees in private sector firms.

Source: OECD estimates using data from the 2005 European Survey of Working Conditions (Eurofound).

29. Table 5 shows the results of regressions on establishment-level data. Overtime results are from a multinomial logit model, where the dependent variable is a three-category variable: no overtime; paid overtime; and compensatory time off or unpaid overtime.[12] The results show the marginal increase or decrease in the probability of each outcome for each characteristic, in percentage points, compared to the base outcome. For performance pay, the results use probit models for each of the four types of performance pay. The results show the marginal increase or decrease, in percentage points, in the probability of the establishment using each type of performance pay for each characteristic.

12 . At the establishment level, this variable reflects the way that overtime is *normally* compensated. "Paid overtime" includes establishments where there is a mix of paid overtime and compensatory time off.

Table 5. **Effect of establishment characteristics on the likelihood of overtime and performance pay**

Estimated coefficients from multinomial logit (overtime) and probit (performance pay) models using establishment data

		Compared with no overtime:		Compared with unpaid overtime:	Performance pay			
		Paid overtime	Unpaid / Time off	Paid overtime	Individual performance pay	Profit-sharing	Team-based bonuses	Share ownership scheme
Establishment size	10-19 employees (base)	..	..	..	..	..	..	..
	20-49 employees	5.7 ***	-0.6	5.7 **	3.2 *	2.5 **	2.2	0.5
	50-249 employees	14.6 ***	-2.3 **	14.6 ***	7.3 **	7.9 ***	7.5 ***	0.8
	250-499 employees	17.2 ***	-2.9 *	17.2 **	13.2 ***	11.0 ***	14.2 ***	2.7 ***
	500+ employees	23.8 ***	-5.9	23.8 ***	18.5 ***	8.5 ***	16.7 ***	5.5 ***
Firm has more than one establishment		2.3	-0.6	2.3	9.0 ***	6.0 ***	7.4 ***	3.0 ***
Foreign ownership	Domestic (base)	..	..	..	..	..	..	..
	Foreign-owned	0.2	2.9 **	0.3 *	10.4 ***	-1.0	6.8 ***	2.0 ***
	Partly foreign-owned	-8.0	3.2	-8.1	8.9 *	1.1	4.1	-0.9
Share of female employees	None (base)	..	..	..	..	..	..	..
	Less than 20%	2.6	-0.1	2.5	-3.4	-1.1	-5.9 *	-0.3
	20-39%	1.4	1.8	1.4	-0.7	-1.4	-2.4	-0.8
	40-59%	-10.2	6.6	-10.2 *	-3.5	0.8	-4.5	-0.1
	More than 60%	-13.2 **	8.1	-13.2 ***	-6.6 *	-1.3	-7.4 *	-0.1
Share of skilled employees	None (base)	..	..	..	..	..	..	..
	Less than 20%	3.6 **	0.2 ***	3.6	7.0 ***	0.6	3.4 ***	0.5
	20-39%	3.6 ***	2.9 ***	3.6 ***	6.8 ***	3.2 **	3.4	1.1 **
	40-59%	-4.0	5.9 ***	-4.0	7.5 **	2.9	6.8 ***	-0.3
	60-79%	-1.2	4.7 ***	1.2	13.8 ***	6.9 ***	11.6 ***	1.3 *
	80-99%	-10.7	11.6 **	-10.7 ***	14.6 ***	8.0 ***	6.6	2.0 **
	All	-7.6	7.1	-7.6 **	4.7	3.9	1.1	1.7
Employs non-std workers	Fixed-term contracts	2.3 ***	1.9 ***	2.2	2.5	-1.0	3.4 **	0.4
	Temporary agency workers	8.2 ***	-1.3 **	8.2 ***	5.4 ***	1.2	3.5 ***	1.2 **
	Freelancers	4.7 ***	0.9 *	4.7	8.7 ***	2.0 ***	3.9 ***	0.3
	Part-time workers	-1.1	-0.3	-1.1	1.8	-0.5	0.7	-0.1
Team work is important		2.4	1.6 ***	2.4	2.2	2.8 ***	8.6 ***	1.4 *
Firm has a collective agreement		4.8	-3.7 ***	4.8 ***	1.4	1.4	0.6	0.9
Firm has an hours accumulation scheme		4.2 ***	5.5 ***	4.2 **	6.2 ***	5.2 ***	3.4 **	1.6 ***
Firm faces variable demand		3.6 ***	3.8 ***	3.6 ***	11.3	1.4	4.9 ***	0.5
Non-std working time	Night	6.6 ***	-0.8	6.7	-2.2	-0.6	-3.8 **	0.2
	Saturdays	6.2 ***	-0.4	6.2	5.1 ***	2.7 **	4.0 ***	1.2 *
	Sundays	3.7	-1.2	3.7	-0.3	-1.3	-1.5	-0.9
Industry dummies		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations		**13567**	**13567**	**13567**	**13528**	**13595**	**13509**	**13545**
Pseudo R-squared		**0.1629**	**0.1629**	**0.1629**	**0.0954**	**0.1525**	**0.1079**	**0.1173**

Note: ***, ** and * indicate that coefficients are significantly different from zero at the 99%, 95% and 90% level, respectively. Robust standard-errors are adjusted for clustering at the country-level. Estimates are weighted so that the effects represent the cross-country average effect. Overtime estimates are from a multinomial logit model with a three-category dependent variable: No overtime; paid overtime; unpaid overtime or compensatory time off. Performance pay estimates are from probit models. Sample includes private-sector establishments only.

Source: OECD estimates using data from the 2009 European Company Survey (Eurofound).

30. The results show that paid overtime and performance pay are significantly more likely for men than women.[13] Women may select out of jobs with performance pay or paid overtime if they face time

13 . While this finding is consistent with recent evidence on the incidence of performance pay (*e.g.* Booth and Frank, 1999, for the UK; de la Rica *et al.*, 2010, for Spain; Dohmen and Falk, 2009, for Germany), it appears to contradict earlier research which found that women were more likely than men to receive piece rates (*e.g.* Goldin, 1986; Drago and Heywood, 1995; Jirjahn and Stephan, 2004). In the earlier research, it was speculated that women select into piece rate jobs in order to offset discrimination in basic wage-setting arrangements or that women's interrupted career patterns make it less attractive for firms to reward women using other types of incentive arrangements such as seniority-based wages. It is possible that the difference in results reflect the fact that we cannot distinguish between piece rates and other individual-level

constraints due to family responsibilities. Even if they are in jobs with the potential for performance pay, they may be less likely to reach performance goals for the same reason. Alternatively, employers and managers might also discriminate against women in awarding performance pay or allocating paid overtime based on perceptions about their commitment to work.[14] The gender gap in performance pay incidence is highest for mothers with children under 15 and for women of child-bearing age without children. This suggests that discrimination may be playing at least a partial role – women are less likely to receive performance pay during their child-bearing years, regardless of whether or not they actually have increased family responsibilities that keep them from contributing at work.

31. Paid overtime is more likely for those with lower levels of education and in blue-collar occupations, whereas performance pay is more likely for the most highly-educated and skilled employees. Low-paid workers may choose to work paid overtime to boost total earnings. Highly-skilled workers might select into jobs with performance pay and also be more likely to receive performance pay when they are in those jobs.[15] Firms might also offer performance pay as a way to attract the most highly-skilled workers. Contract type has little impact on employees' likelihood of receiving performance pay (except profit sharing) or paid overtime, but workers with longer tenure are more likely to receive performance pay. In contrast, firms that employ temporary workers (and operate at non-standard times) are also more likely to offer paid overtime and some kinds of performance pay, suggesting that firms use multiple forms of flexibility simultaneously. Paid overtime seems to be used by firms to deal with variable demand. Hours accumulation schemes are also associated with the use of both paid and unpaid overtime.

32. Task complexity and the ease of monitoring workers also affect the incidence and type of performance pay. More complex and unpredictable jobs and those that involve team-work are more likely to receive team- or firm-based performance pay. This confirms the view that if individual performance is difficult to measure or monitor, firms are more likely to use performance-pay schemes where rewards depend on the overall output of a team or firm (Drago and Heywood, 1995; Prendergast, 1999). Larger or more complex firms, where monitoring individual workers' performance is most costly, are also more likely to use performance pay. Workers who feel that they have a good chance of promotion are also more likely to receive performance pay and work paid overtime. This suggests that performance pay is not a substitute for promotion-based incentive schemes: the most productive workers are rewarded in multiple ways. Finally, performance pay does not seem to be influenced by the presence of a collective agreement, but firms with a collective agreement are more likely to use paid than unpaid overtime.

5. The impact of earnings volatility on household welfare

33. In a world where workers have perfect foresight about future earnings, can buy insurance against earnings fluctuations, and are able to save or borrow money to smooth consumption, temporary changes in earnings should have no impact on household consumption (Friedman, 1957). In reality, earnings volatility may have a large impact on household welfare. It is often difficult for workers to foresee earnings changes

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performance pay such as commissions or bonuses. Indeed, by restricting the sample to the industries (manufacturing, agriculture) or occupations (agricultural workers, tradespersons, plant and machine operators) that are most likely to receive piece rates, the results for women become non-significant, although this could be due to the much smaller sample size.

14 . de la Rica, *et al.* (2010) suggest that firms may exert monopsony power over women because of their lower labour mobility, allowing firms to deny women access to jobs with performance pay.

15. Dohmen and Falk (2009) suggest that highly-skilled workers choose individual performance pay arrangements over team-based arrangements or profit sharing because their reward is influenced by the performance of their less-able colleagues. However, there is no evidence that this is the case in the results presented here. If anything, the most highly-skilled workers are more likely to choose group schemes and less likely to choose individual bonuses than lower-skilled workers.

or assess whether they are permanent or temporary. Private insurance markets for individual earnings volatility are poorly developed. Public unemployment insurance typically provides income support only in the case of job loss (or loss of a significant number of hours of work) whereas public disability insurance only protects against income volatility in limited circumstances. Those workers with the most volatile earnings, such as temporary workers or the self-employed, may have limited recourse to public insurance schemes. Access to credit and savings may also be limited for workers who have lost a significant part of their income or among low-income earners more generally (*e.g.* Simpson and Buckland, 2009; Devlin, 2005).

34. However, even in light of market imperfections, there are several possible buffers against individual earnings volatility having an adverse impact on household welfare. First, most individuals live in multi-person households, so changes in one individual's earnings may be offset by compensating changes in the earnings of other household members or in other forms of income (such as income from rental property or other investments). Second, large fluctuations in individual earnings may also be offset by the operation of the tax and transfer system. As a result, fluctuations in household disposable income, which is what matters most for consumption, are likely to be smaller than fluctuations in individual earnings. This section will examine the operation of these buffers and the extent to which individual earnings volatility translates into poorer household welfare.

5.1. Buffers against individual earnings volatility

35. To examine the extent to which other forms of income, taxes and transfers buffer individuals against earnings volatility, we decompose the change in household disposable income resulting from a large increase or decrease in individual gross labour earnings into various sub-components as follows:

$$\Delta HY_{net} = \Delta(HY_{net} - HY_{gross}) + \Delta(HY_{gross} - HY_{labour}) + \Delta(HY_{labour} - IY_{labour}) + \Delta IY_{labour}$$

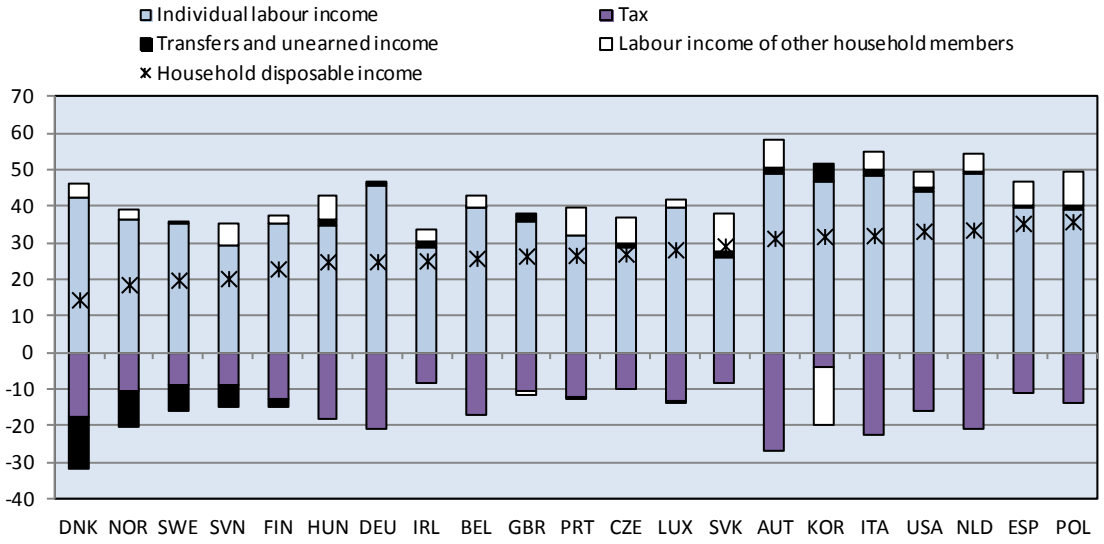
where *HY* is household income/earnings, *IY* is individual earnings and the subscripts denote net income, gross income and labour earnings. The first bracket on the right-hand side is equal to the component due to changes in taxes, the second bracket is the component due to changes in transfers and other non-earned household income, the third bracket is the component due to changes in the labour earnings of other household members and the last term is the component due to changes in individual labour earnings. This decomposition is performed country-by-country on the sample of individuals from Section 3 who experienced an increase or decrease in individual gross labour earnings of 20% or more from one year to the next.[16] To reduce the impact of changes in household size, the analysis is limited to households with one or two adults (and where the number of adults is the same in both years), with or without children aged under 18 years.

36. Figure 6 and Figure 7 show how an increase or decrease in individual gross labour earnings of 20% or more affects household disposable income in selected OECD countries. Figure 6 shows the impact of fluctuations within full-time work, whereas Figure 7 also includes fluctuations resulting from changes in hours and movements into and out of work.

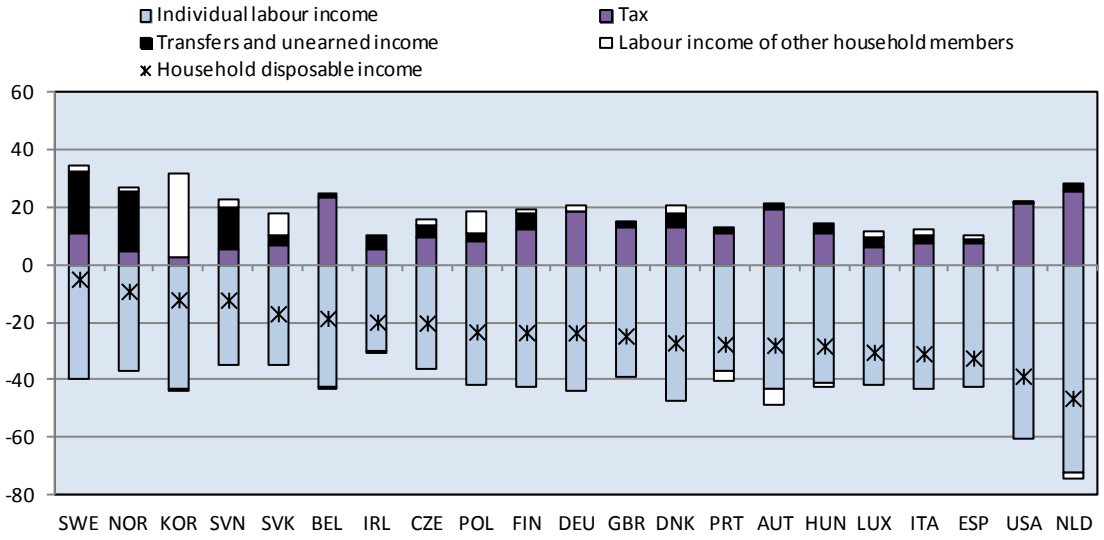
16 . Because of the difficulty in assigning a meaningful increase or decrease in earnings to those who entered or left work between the two years examined, this analysis excludes workers who did not have any labour earnings in at least one of the years.

Figure 6. **Decomposition of change in household disposable income resulting from full-time individual earnings volatility**

A. For individuals experiencing at least a 20% increase in labour earnings



B. For individuals experiencing at least a 20% decrease in labour earnings

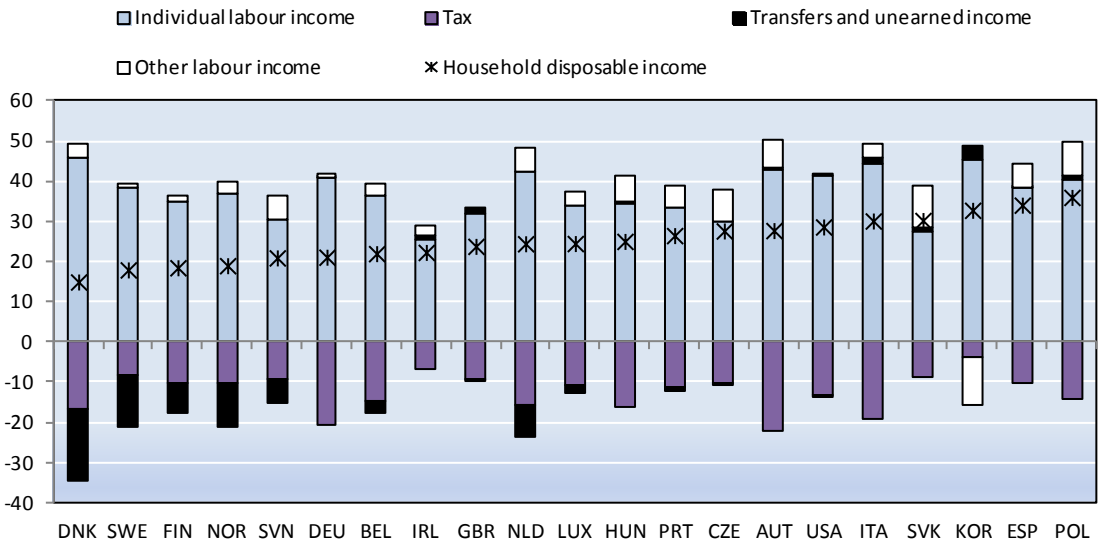


Note: People aged 25-59 years. Households with one or two adults and no year-to-year change in the number of adults in the household. Sample includes individuals who worked full-time for the full year in each of the two years over which calculations are made.

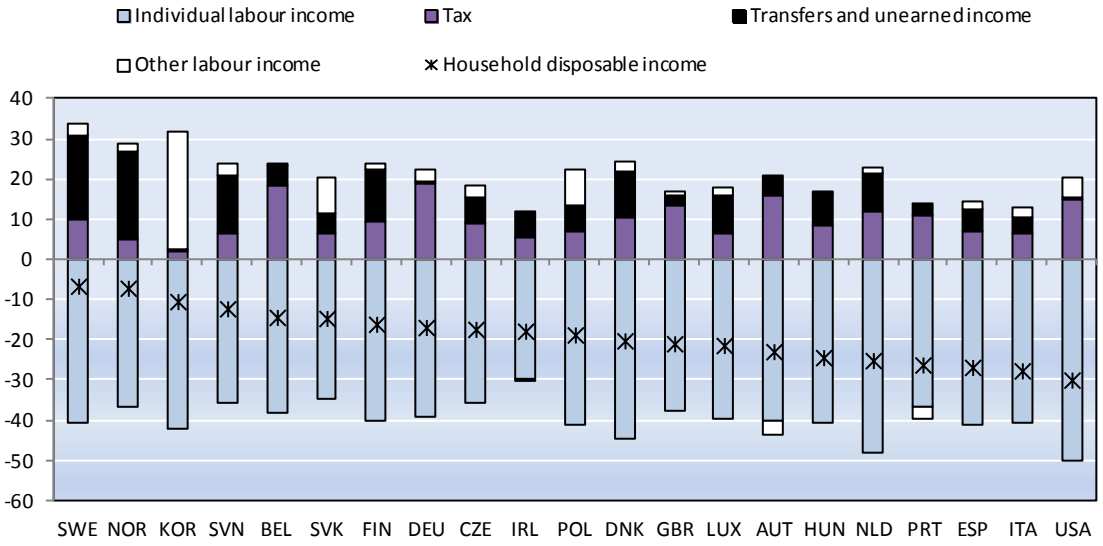
Source: OECD calculations using data described in the note to Figure 1.

Figure 7. **Decomposition of change in household disposable income resulting from overall individual earnings volatility**

A. For individuals experiencing at least a 20% increase in labour earnings



B. For individuals experiencing at least a 20% decrease in labour earnings



Note: People aged 25-59 years. Households with one or two adults and no year-to-year change in the number of adults in the household. Sample includes individuals who worked at least some time in each of the two years over which calculations are made.

Source: OECD calculations using data described in the note to Figure 1.

37. The results show that there is significant cross-country variation in the extent to which individual earnings volatility flows on to household disposable income. In almost every country, household disposable income is buffered from the full impact of individual earnings volatility.[17] Buffering is

17 . The exception is for large increases in earnings in the Slovak Republic.

particularly strong in the Nordic countries. For instance, in the case where overall earnings volatility is considered, the change in household disposable earnings in the Nordic countries is on average only 46% of the size of an increase in individual gross labour earnings and 30% of the size of a decrease. At the other end of the scale, in Portugal, Spain, Italy and Ireland, large increases and decreases in individual earnings translate into relatively large changes in household disposable income: 81% of the size of an increase in individual earnings and 66% of the size of a decrease, on average. It is interesting to note that the countries where buffering is most pronounced are also those with among the lowest incidence of earnings volatility (c.f. Figure 1). In contrast, less effective buffering occurs in countries where earnings volatility is more widespread.

38. In most countries, offsetting changes in tax are the most prominent buffer for households against individual earnings volatility, especially in the case of large increases. In the case of large decreases in earnings, offsetting changes in transfers and other unearned income are relatively large. In cases where earnings volatility is due only to changes within full-time work, the role of transfers is much reduced. On average, the change in transfers is around 19% of the size of the reduction in individual earnings in the case of a large decrease and 7% in the case of a large increase when including volatility due to movements in and out of work, compared with 11% and 3%, respectively, in the case where only full-time workers are considered. This suggests that transfer payments are more effective at smoothing earnings volatility when it results from movements into and out of work than when it results from changes in earnings for workers who remain employed, which is not surprising given that most working-age income-support payments are available only in case of job loss and are withdrawn quickly when individuals take up work. In contrast, the proportionate change in taxes is slightly larger (26% the size of a decrease in individual earnings and 36% the size of an increase) where only full-time workers are considered compared to when there are movements into and out of work (24% and 34%, respectively).

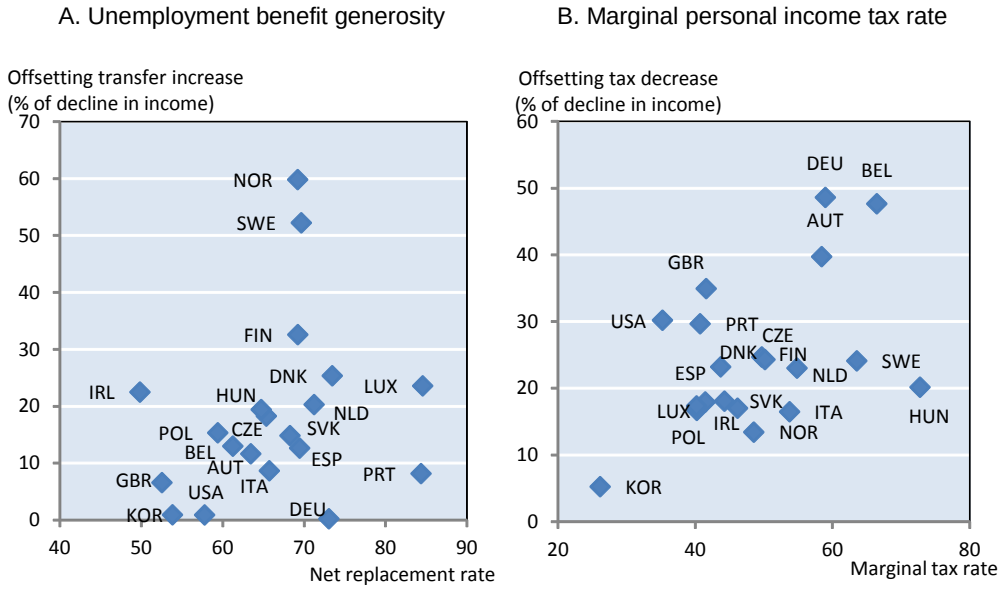
39. In Korea, there are significant offsetting movements in other household members' labour earnings. A large increase in an individual's labour earnings is accompanied by a decrease of around one-third of the size in the labour earnings of other household members, while a large decrease in individual earnings induces an increase by other family members of more than two-thirds the size. The same pattern is evident to a much more limited extent in Poland and the Slovak Republic when an individual has a large increase in labour earnings. This suggests that households may be making up for the relatively undeveloped social protection systems in these countries.

40. Not surprisingly, the design of countries' tax and benefit systems explains part of the difference in the extent of buffering across countries. In the event of a large decrease in individual gross labour earnings, Figure 8 shows that the countries with the largest offsetting declines in taxes tend to be the countries with among the highest marginal tax rates (Germany, Austria, and Belgium). Likewise, the countries with the largest offsetting increases in transfers tend to have more generous unemployment benefits (Norway, Sweden, Finland and Denmark). For example, Hungary and Sweden have relatively high marginal tax rates, but relatively low offsetting tax decreases, whereas Luxembourg and Portugal have generous unemployment benefits, but relatively low offsetting transfer decreases.

41. Some of this discrepancy could be due to measurement error. Estimates of tax and transfer offsets in this chapter rely on gross and net measures of household income collected in household surveys, which may be inaccurate. Changes to transfers other than unemployment benefits – such as family payments, sickness or disability benefits or social assistance – and to unearned income such as rent or interest could also play an important role. Finally, gaps in the coverage of the tax and transfer system could undermine its role in buffering households against earnings shocks. For example, in Portugal, long contribution periods for unemployment insurance mean that younger workers or those on temporary contracts – both groups that are more vulnerable to earnings volatility – might not receive benefits if they become unemployed

(OECD, 2010c). Likewise, underreporting of personal income for tax and social security purposes is thought to be relatively common in Hungary (OECD, 2008).

Figure 8. **Tax and benefit policy and the degree of buffering of large individual earnings decreases**



Note: Offsetting transfer increase/tax decrease are as a percentage of the average decline in individual gross labour earnings resulting from a decrease of at least 20%. Unemployment benefit generosity is the net replacement rate for initial unemployment benefits averaged over three income levels and three family types.

Source: Author's calculations using data from in Figure 7. Net replacement rate data are from the OECD Tax and Benefit Database. Marginal tax rate data are from the OECD Taxing Wages Database.

5.3. The impact of earnings shocks on household poverty and financial stress

42. The previous section shows that governments and households themselves play a role in buffering households against individual earnings volatility, but large changes in individual earnings typically flow through, at least in part, to household disposable income. However, there is little empirical evidence on the relationship between earnings volatility and household welfare.[18] This section will examine whether or not an individual who experiences a large increase or decrease in gross labour earnings is more likely to live in a poor households or in a household that has experienced financial stress.

43. By definition, large changes in household income will affect the likelihood that a household experiences poverty where poverty is defined on a relative basis depending on the household's position in the income distribution. In the analysis in this section, we define a household as being in poverty if equivalised household disposable income is less than 50% of the median equivalised household disposable income in the country in which they live.[19]

18. A notable exception is Diaz-Serrano (2004) who examines the impact of household income volatility (measured by the coefficient of variation in net household annual income over time) on the likelihood of mortgage delinquency. He finds that volatility significantly increases the risk of not meeting mortgage payments and also reduces the likelihood of being a homeowner rather than a renter.

19. Household disposable income is equivalised for household size by dividing by the square root of the number of people (adults and children) living in the household.

44. Large changes in income could also affect household consumption patterns. Unfortunately, the data used to estimate earnings volatility do not contain any measures of household consumption. However, we can examine the impact of earnings volatility on consumption indirectly by looking at various measures of financial stress in households. We assume that the experience of financial stress is an indicator of a change in the household that has affected household consumption. For example, an event that leaves the household unable to pay the rent, mortgage or major bills is likely to have also impacted on household consumption. The measures used are:

- whether the household has been in arrears on a rent or mortgage payment in the last 12 months due to a lack of money;[20]

- whether the household has been in arrears on a water, gas or electricity bill in the last 12 months due to a lack of money;

- inability to afford a one-week annual holiday away from home (regardless of whether or not the household has taken a holiday);

- inability to afford a meal with chicken, meat or fish (or vegetarian equivalent) every second day, if wanted; and

- inability to face unexpected financial expenses (where the size of the unexpected expense is the monthly country-specific poverty threshold for one person) using the financial resources of the household.

45. The analysis of the link between earnings volatility and household welfare is performed at the individual level using probit regression models where the dependent variable is an indicator that is equal to one if the individual lives in a household that experienced poverty or financial stress in year *t* and zero otherwise. Earnings volatility is included as the same categorical variable used in section 4, where the base category is those who experienced year-to-year gross labour earnings changes between -5% and 5% and the categories of interest are those who experienced at least a 20% or at least a 20% decrease in earnings. In both cases, the change in earnings is measures from year *t-1* to year *t*.

46. The models also include controls for household and personal characteristics in year *t-1*. Drawing on existing empirical literature on the factors that affect household financial stress (Boheim and Taylor, 2000; Diaz-Serrano, 2004; Gerogarakos, *et al*., 2010; Worthington, 2006), the models include controls for household composition (household size; marital status; whether someone in the household has a serious health problem), housing tenure and wealth (whether household are homeowners, renting at market or below-market rates; the extent to which housing costs are a financial burden; dwelling size), personal characteristics to control for life-cycle effects and unobservable risk preference and access to credit markets (age, gender, education), year and country effects. As in the previous section, the sample is limited to individuals aged 25-59 in year *t-1* living in households with one or two adults (with or without children aged under 18) where the number of adults in the household does not change from year *t-1* to year *t*.

47. Poverty and financial stress tend to be persistent, so it is important to control for previous experience of financial stress. We control for this in two different ways. First, we include in the sample only those individuals who did not experience poverty or financial stress in year *t-1*. Typically this exclusion affects only a small number of observations. However in a sample of, for example, individuals from low-income households, this exclusion has a much bigger impact on the size and representativeness

20. Homeowners who do not have a mortgage are given a value of zero for this variable.

of the sample and may skew the results. To test the impact of the exclusion, we re-run the regressions with all observations but including a control for poverty or financial stress in year *t-1*. The estimated effects tend to be slightly larger, but the broad direction of the results is similar.

48. Table 6 presents the marginal effects of having a 20% increase or 20% decrease in individual gross labour earnings on the likelihood of household poverty and financial stress. The results show that, compared with having no large change in earnings, having a large decrease in earnings is associated with a significantly higher likelihood of experiencing poverty and all types of financial stress. Large increases in earnings tend to be associated with a reduced risk of household poverty and financial stress. As expected, the effect of negative earnings shocks tends to be smaller in the countries (identified in Figure 7) where the tax/transfer system provides a strong buffer against volatility and larger in countries where individual earnings shocks pass more fully onto household disposable income. This is true of both positive and negative earnings shocks; indeed large increases in earnings have no significant effect on household poverty or financial stress in the high-buffer countries.

Table 6. **Effect of individual earnings volatility on the probability of household poverty and financial stress**

Marginal effects (in percentage points) for workers with volatile earnings compared with workers with year-to-year change in gross labour earnings of between +5% and -5%

	All countries		High-buffer countries (SWE, NOR, SVN, BEL)		Low-buffer countries (PRT, ITA, ESP, HUN)	
	20% decrease	20% increase	20% decrease	20% increase	20% decrease	20% increase
Dependent variable:	Sample with initial poverty/financial stress = 0					
Household in poverty	6.7 ***	-0.2 *	3.8 ***	0.1	8.9 ***	-0.5 **
Can't pay bills	0.9 ***	-0.1	1.2 *	0.2	1.0	-0.6
Can't pay rent/mortgage	0.6 ***	-0.1	0.5	0.0	1.0 *	-0.4
Can't cope with unexpected expenses	2.5 ***	-1.2 ***	2.9 ***	0.7	2.2	-4.4 ***
Can't afford a holiday	2.8 ***	-1.0 **	2.3 ***	-0.2	3.7 ***	-3.0 ***
Can't afford to eat meat	0.5 ***	-0.2	0.2	0.1	0.3	-0.4
Dependent variable:	Full sample with control for initial poverty/financial stress					
Household in poverty	8.0 ***	-0.7 ***	5.1 ***	-0.1	12.1 ***	-1.6 ***
Can't pay bills	1.0 ***	-0.2	1.0	-0.5	1.4 **	-0.3
Can't pay rent/mortgage	0.9 ***	0.0	0.9 **	0.1	0.9 *	-0.3
Can't cope with unexpected expenses	3.4 ***	-3.5 ***	3.3 ***	0.0	1.8	-8.6 ***
Can't afford a holiday	3.8 ***	-2.3 ***	2.8 ***	-0.7	4.7 ***	-5.5 ***
Can't afford to eat meat	0.5 **	-0.4 ***	0.3	0.0	0.1	-0.9 ***

Note: Marginal effects are calculated at the sample mean of all other variables and are the difference in probability of poverty or financial stress compared with someone who has a change in gross labour earnings of between +5% and -5%. ***, ** and * indicate that underlying coefficients are significantly different from zero at the 99%, 95% and 90% level, respectively. Robust standard-errors are adjusted for clustering at the country-level. Estimates are weighted so that the effects represent the cross-country average effect.

Source: Author's calculations using data from the EU-SILC for years 2004-2008.

49. The size of the estimated effects differs for different groups of workers (Table 7). Compared with the baseline case, a large decrease in earnings is associated with a much larger increase in poverty risk or financial stress for workers from the poorest 40% of households and those whose earnings make up 75% or more of total household gross earnings (so-called "main breadwinners"). This may be because lower-income households are closer to the poverty threshold even in good times, and have less access to credit or savings to buffer them against earnings shocks. A decline in the individual earnings of the main breadwinner will have a greater impact on household earnings, simply because their earnings make up the majority of household earnings, but also because it might be more difficult for other household members to compensate by working more hours if they are not already in the workforce. In contrast, negative earnings shocks have a much smaller impact on individuals in the richest 40% of households.

Table 7. **Effect of negative earnings shock on the probability of household poverty and financial stress, by worker characteristics**

Marginal effects (in percentage points) for workers with at least 20% decrease in gross labour earnings compared with workers with year-to-year change in gross labour earnings of between +5% and -5%

	Baseline	By household income:		By employment status:			Youth (15-24 yrs)	Main breadwinner
		Poorest households	Richest households	Permanent employee	Self-employed	Temporary contract		
Dependent variable:	Sample with initial poverty/financial stress = 0							
Household in poverty	6.7 ***	22.6 ***	1.8 ***	5.1 ***	7.5 ***	17.3 ***	7.2 ***	11.8 ***
Can't pay bills	0.9 ***	1.9 ***	0.4	0.7 ***	3.0 ***	0.8 *	1.7 *	1.4 ***
Can't pay rent/mortgage	0.6 ***	0.9 *	0.2	0.8 ***	0.2	0.1	2.1 ***	0.9 ***
Can't cope with unexpected expenses	2.5 ***	4.2 **	0.9 *	2.5 ***	2.7	1.9	2.6	3.9 ***
Can't afford a holiday	2.8 ***	3.6 **	1.8 ***	2.3 ***	7.2 ***	2.8 **	5.3 **	4.2 ***
Can't afford to eat meat	0.5 ***	1.6 ***	-0.1	0.5 **	1.8 **	0.9 ***	-0.8	0.9 ***
Dependent variable:	Full sample with control for intial poverty/financial stress							
Household in poverty	8.0 ***	26.0 ***	1.8 ***	5.5 ***	23.2 ***	11.5 ***	6.3 ***	14.7 ***
Can't pay bills	1.0 ***	2.4 ***	0.3	0.9 ***	0.7	3.0 **	3.5 **	1.5 ***
Can't pay rent/mortgage	0.9 ***	1.5 **	0.2	1.0 ***	0.4	0.6	3.2 ***	1.4 ***
Can't cope with unexpected expenses	3.4 ***	4.9 **	1.5 **	2.8 ***	3.8 **	7.7 **	3.3	5.2 ***
Can't afford a holiday	3.8 ***	4.1 **	2.4 ***	3.0 ***	4.5 **	10.2 ***	3.0	5.1 ***
Can't afford to eat meat	0.5 **	1.6 **	-0.1	0.4 *	0.2	1.7 *	-1.0	0.7 **

Note: Marginal effects are calculated at the sample mean of all other variables and are the difference in probability of poverty or financial stress compared with someone who has a change in gross labour earnings of between +5% and -5%. ***, ** and * indicate that underlying coefficients are significantly different from zero at the 99%, 95% and 90% level, respectively. Robust standard-errors are adjusted for clustering at the country-level. Estimates are weighted so that the effects represent the cross-country average effect.

Source: Author's calculations using data from the EU-SILC for years 2004-2008.

50. Section 4 showed that some groups of workers – including the self-employed, temporary workers and youth – are more prone to earnings shocks than others. These groups also tend to have poorer coverage by unemployment benefits in the event of job loss (OECD, 2011), raising the question of whether they are more vulnerable to the negative impacts of earnings volatility as a consequence. The results on this are mixed. Self-employed and temporary workers who are subject to an earnings shock tend to have a greater increased risk of poverty than the average worker, but the effect on financial stress is somewhat ambiguous.

6. Conclusion

51. This paper has examined the incidence and characteristics of earnings volatility, as well as its impact on household income and welfare. Tax and transfer systems are shown to play an important role in buffering households against the impact of individual earnings volatility. Nevertheless, large changes in individual earnings can still have a significant impact on household welfare in many OECD countries. The incidence of earnings volatility varies considerably across countries, even after controlling for cross-country differences in the characteristics of workers and jobs. This suggests that institutions and policies may play an important role. Indeed, using aggregate and industry-level data, OECD (2011) and Bassanini (2011) find that labour market institutions can affect how earnings fluctuate over the business cycle. Ideally, this analysis would be extended using microdata and the types of measures of earnings volatility examined in this paper. However, time series data on earnings volatility are currently available for only a small number of countries. Future work should focus on using microdata covering longer periods of time for a large number of countries to further explore the impacts of policies and institutions on the incidence of earnings volatility.

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