Aaron Reeves, Rachel Loopstra and David Stuckler

The growing disconnect between food prices and wages in Europe: cross-national analysis of food deprivation and welfare regimes in twenty-one EU countries, 2004–2012

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The growing disconnect between food prices and wages in Europe: cross-national analysis of food deprivation and welfare regimes in 21 EU countries, 2004-2012

Aaron Reeves[*], Rachel Loopstra[†], David Stuckler[‡]

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Abstract:

Food insecurity has been rising across Europe following the Great Recession, but to varying degrees across countries and over time. The reasons for this increase are not well understood, nor are what factors might protect people's access to food. Here we test the hypothesis that an emerging gap between food prices and wages can explain increases in reported inability to afford protein-rich foods and whether welfare regimes can mitigate its impact. We collected data on 21 countries from 2004-2012 on food prices and deprivation related to food, denoted by reported in ability to afford to eat meat, chicken, fish or a vegetarian equivalent, every second day, from EuroStat 2015 edition and on wages from the OECD 2015 edition. After adjusting for macroeconomic factors, we found that each 1% rise in the price of food over and above wages was associated with greater self-reported food deprivation (β = 0.063, 95% CI: 0.033 to 0.092); particularly among impoverished groups. But, this association also varied across welfare regimes. In Eastern European welfare regimes, a 1% rise in the price of food over wages was associated with a 0.081 percentage point rise in food deprivation (95% CI: 0.051 to 0.11) while in Social Democratic welfare regimes we find no clear association (p = 0.37). Rising prices of food coupled with stagnating wages are a major factor driving food deprivation, especially in deprived groups; however, our evidence indicates that more generous welfare systems can mitigate this impact.

[*]International Inequalities Institute, London School of Economics, `a.reeves@lse.ac.uk`

[†]Department of Nutrition and Dietetics, King's College London

[‡]Department of Sociology, University of Oxford

INTRODUCTION

Since 2010, there is evidence that many European nations have experienced a marked rise in household food insecurity,[1] broadly defined as insecure or insufficient access to the quality or quantity of food to meet needs.[2] Over 2010 to 2013, the EU-measure of food deprivation, namely, self-reported inability to afford a meal containing protein-rich food every other day, increased by an average 2.7 percentage points, corresponding to an additional 13.5 million people.[1] In the UK, Greece, and other nations, queues for emergency food assistance – commonly seen in the Great Depression of the 1920s – have become commonplace.[3,4]

There is clear evidence that food insecurity harms health, both in the short- and long-term. Food insecurity is correlated with inadequate dietary intakes, nutrient deficiency, and other diet-related chronic conditions.[5,6] Insecure and insufficient access to food can also lead to psychological distress and depression. [7-10]

It is unclear what has caused the rise in food insecurity across Europe. [4,11-13] It does not appear to be a data artefact, as there was little change in the process used to collect data on EU food deprivation during this period.[14] This rise is also a departure from historical trends which, prior to 2009, had been declining. [1] Economic shocks, such as rising unemployment and stagnating wages, appear to have contributed to the reported rise in food deprivation but only explained part of the increase.[15]

One possible explanatory factor is the rising cost of food, which increased dramatically following the food price shock in 2007. [4,16] In Europe, for example, food prices rose by approximately 13% between 2005 and 2008, while other goods and services remained relatively flat. [17] Since then (and until recently) food prices have continued to rise rapidly in many European countries. In the UK, for example, food prices rose 32% between 2007 and 201218 corresponding to an 8.5% decline in real household expenditure on food. [19] Similarly, rising food prices in the U.S. are correlated with greater food insecurity.[20] Notwithstanding these preliminary analyses, there is little evidence linking food prices and food insecurity in the EU.

Essential for understanding potential effects of rising food prices, however, is examining how prices have changed relative to trends in annual wages. Recent trends are particularly worrying because between 2009 and 2013, wages stagnated in most European nations. [21] As a result, recent rises in food prices have outstripped wage gains by as great as 1.7-fold in some countries. Together, rising food prices coupled and stagnating wages have potentially placed an additional burden on household budgets, leaving people to make difficult decisions regarding how they spend (in real terms) a smaller pot. We hypothesise that this growing disconnect between prices and wages is a critical population driver of household food insecurity in Europe and that this would particularly be the case for low-income households, for whom food spending takes up a relatively larger proportion of disposable income compared to households with higher earnings.[19]

Counteracting these processes, the generosity of social security may help buffer people from the consequences of rising prices and stagnating wages; and this may explain why reported

inability to afford protein-rich foods has not risen everywhere across the EU.[1,15,22] The price-wage disconnect may have a lesser impact on the ability of households to feed themselves in countries where social security systems are well-developed (e.g. able to respond quickly to rising need) and generous (e.g., increasing disposable incomes to a greater extent).[23,24] We hypothesise, therefore, that welfare regime types, which measure the generosity and extensiveness of social security, may alter the association between the price-wage disconnect and reported food deprivation. For example, for a given rise in food prices over and above wages, countries with Social Democratic or Corporatist welfare regimes – the most generous and extensive welfare regimes – may have experienced smaller rises in food deprivation than the Mediterranean, Eastern European, or even Liberal welfare regimes, where less generous social security systems are in place.[25]

Here, using data from 21 EU countries between 2004 and 2012, we test these two main hypotheses: 1) the rising disconnect in the cost and affordability of food was associated with recent rises in food deprivation – particularly among low-income households – and 2) welfare regime type moderated the impact of this price-wage disconnect on food deprivation.

METHODS

DATA SOURCES

Our data come from two organisations that provide harmonized economic and social data across countries, namely, the Organisation for Economic Co-operation and Development (OECD) and EuroStat. The former collects primarily economic and policy data from advanced economies; we extracted data on average annual wages from this database. [26] EuroStat is the statistical office of the European Union, responsible for processing and reporting on data collected from EU Member States and ensuring they are collected using harmonised methodology. Their database includes measures of material deprivation, which are collected in the EU Survey of Income and Living Conditions by Member States (EU-SILC) [14] and used to monitor poverty across the EU. One component is an indicator of food deprivation, which is a national estimate of the proportion of households reporting the inability to afford meat, chicken, or fish (or a vegetarian equivalent) every second day, an amount generally recommended in food-based dietary guidelines across European countries.[27] This measure captures qualitative compromises in food intake related due to constrained financial resources, providing an indication of one dimension of household food insecurity,[28] though it has never been directly compared to household food insecurity scales used in other countries (e.g. USDA Household Food Security Module). It has been found to correlate with other indicators of poverty and food hardship in Ireland, however.[27] EuroStat also collects information on food prices, providing measures of inflation year-on-year, and other macroeconomic measures, including gross domestic product and unemployment rates.[17]

Linking data from OECD and EuroStat databases, our dataset covers 21 countries, including: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Ireland, Luxembourg, the Netherlands, Poland, Portugal, Slovak Republic, Slovenia,

Figure 1: Food price inflation and wage inflation in Greece and the United Kingdom.
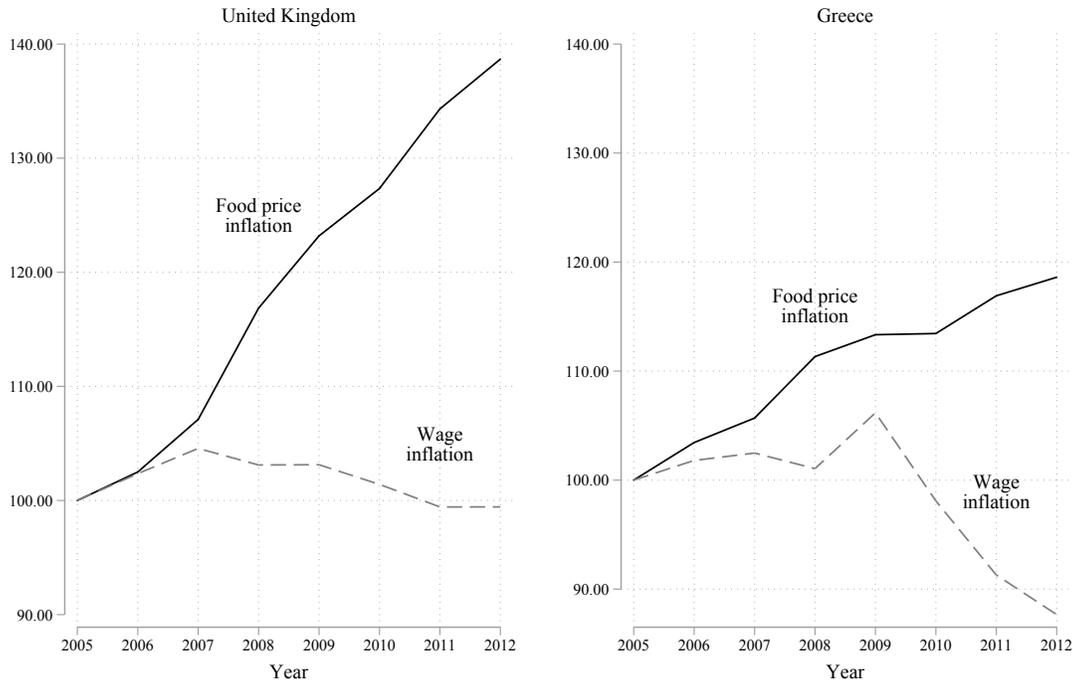
Spain, Sweden, and the United Kingdom from 2004 to 2012, the latest available year data were available for wages.

To measure the disconnect between wages and the cost of food, we constructed a new variable measuring the difference between food price inflation and wage inflation (based on earned incomes), as the percentage change in consumer prices for food minus the percentage change in wages. To illustrate this measure we use data from Greece and the UK (see figure 1). Food prices have risen twice as fast in the UK than in Greece; in fact, food prices fell in Greece in 2009. Yet, this slight fall in food prices likely did not ease the financial pressure faced by households because wages also fell. Thus, despite the divergent patterns in both countries, the difference between food inflation and wage inflation widened through this period.

STATISTICAL MODELS

To adjust for potential confounding factors, we used cross-national multivariate regression models, based on 'first-differences' (annual changes), as follows:

$$\Delta FoodDep_{ij} = \beta_1 Disconnect_{ij} + \beta_2 \Delta GDP_{ij} + \beta_3 \Delta Unemployment_{ij} +$$
$$\beta_4 \Delta year_{ij} + \epsilon_{ij} \tag{1}$$

Here i is country, j is year, and Δ captures annual change. This adjusts for country-specific differences that are relatively constant over time. As outlined, $FoodDep$ is the prevalence of reported inability to afford a meal with a protein source every second day. $Disconnect$ is the aforementioned measure of food price inflation net of wage inflation. GDP is a measure of gross domestic product per capita, adjusted for purchasing-power and inflation, $Unemployment$ is the unemployment rate, $year$ is the average change in food deprivation across countries and over time (which is effectively the constant in a first-difference model), [29] and ε is the error term. Both GDP and unemployment capture the direct effect of the recession on rising food deprivation.

As rising food prices disproportionately affect households with smaller incomes,18 we then stratified the analysis to compare associations in those in poverty (i.e., household income is below 60% of the median income) and those not in poverty (i.e., household income is above 60% of the median income).

In subsequent models we test whether welfare regime type moderated the relationship between food deprivation and the price-wage disconnect using a series of interaction terms with indicators of welfare regime type. Following Bambra and Eikomo, we define welfare regimes according to commonly used definitions, which ranks countries according to the generosity of their social protection programmes.[30,31] In our sample, the Social Democratic countries are Denmark, Finland, and Sweden; the Corporatist (or Bismarckian) welfare regimes are Austria, Belgium, France, Germany, Luxembourg, and the Netherlands; the Liberal (or Anglo-Saxon) welfare regimes are Ireland and the United Kingdom; the Mediterranean welfare regimes are Greece, Italy, Portugal, and Spain; and the Eastern European welfare regimes are Czech Republic, Estonia, Hungary, Poland, Slovakia, and Slovenia. [32-35]

Standard errors were clustered by country to reflect non-independence of sampling. All models were estimated in STATA v.13.

RESULTS

IMPACT OF THE GROWING DISCONNECT BETWEEN PRICES AND WAGES

Table 1 reports the results of our cross-national models of food price disconnect and food deprivation. As shown in the table and Figure 2, there was a positive, strong association. Each 1% rise in food price inflation above wage inflation corresponded to an increase in food deprivation by 0.060 percentage points (95% CI: 0.024 to 0.095). To take one specific example, food prices rose 5.9% over and above wages in the UK from 2009 to 2010. Our models suggest this corresponded to an increase in food deprivation by 0.35 percentage points (95% CI: 0.14 to 0.56). This is about one-third of the overall rise in this period of 1.1 percentage points.

Table 1: Food deprivation and the price-wage disconnect in 21 EU countries, 2004 and 2012.

Covariates	Percentage point change in food deprivation (%)		
	(1)	(2)	(3)
Per 1% rise in food prices above rise in wages	0.060**	0.062**	0.060**
	(0.017)	(0.017)	(0.014)
$100 annual increase in GDP per capita		0.0090	0.029*
		(0.0073)	(0.014)
1ppt rise in unemployment rate			0.38**
			(0.11)
Observations	166	166	166
Countries	21	21	21
R^2	0.16	0.17	0.28

Notes: Source: OECD and EuroStat. Constant (which in a difference model estimates the average annual change in food deprivation) is estimated but not shown. Standard errors reported in parentheses and are calculated to account for repeated observations within the same country. * $p < 0.05$, ** $p < 0.01$

We found this association was consistent, even after adjusting for falling GDP and rising unemployment, which had the anticipated associations, corresponding with worse food deprivation (β GDP = 0.029, 95% CI: 0.0011 to 0.058; β Unemployment = 0.38, 95% CI: 0.14 to 0.62).36

To put the magnitude of these associations into perspective, each additional $100USD per capita of GDP corresponded to a 0.029% drop in food deprivation. Thus, to offset a 1% rise in food prices, each person would need an additional $200 per year.

Next, we decompose the explained variance into the component parts of the model using the Shapley method.37 Most of the explained variance, approximately 54%, is attributable to the disconnect between food prices and wages, the remaining 45% is associated with changes in GDP and unemployment, and other time trends (Web Appendix 1). A large portion of unexplained variance still remains.

As highlighted, we hypothesised the growing gap between food prices and wages would be most closely associated with rising food deprivation among the poorest groups. We test this by stratifying households into those above and below the poverty line (i.e. incomes above and below 60% of the median income). For every 1% rise in food price inflation above wage inflation, food deprivation rose by 0.13 percentage points among people in poverty (95% CI: 0.084 to 0.17) (see Table 2) but only 0.044 percentage points (95% CI: 0.015 to 0.074) among people above the poverty line (Test of effect heterogeneity: χ^2 14.02, p = 0.0002).

Figure 2: Relationship between the food price-wage disconnect and change in food deprivation, 21 EU countries, 2004-2012.

Notes: When the 'Food price inflation over and above wage inflation' variable is greater than zero then the rise in food prices was greater than the rise in real wages. When the 'Food price inflation over and above wage inflation' variable is less than zero then food price inflation was lower than the rise in real wages. Countries: Italy, Greece, Hungary, United Kingdom, Estonia, Czech Republic, Ireland, Netherlands, Finland, Belgium, Spain, Denmark, Luxembourg, Sweden, France, Slovak Republic, Germany, Slovenia, Portugal, Poland, and Austria. Model adjusted for annual changes in unemployment and GDP, and includes average annual change in food deprivation over time.

Table 2: Food deprivation, poverty, and the price-wage disconnect in 21 EU countries, 2004 and 2012.

| Covariates	Percentage point change in food deprivation (%)	
	Above poverty-line	Below poverty-line
Per 1% rise in food prices above rise in wages	0.044**	0.13**
	(0.014)	(0.020)
$100 annual increase in GDP per capita	0.025*	0.039
	(0.011)	(0.022)
1ppt rise in unemployment rate	0.29*	0.59*
	(0.11)	(0.24)
Observations	166	166
Countries	21	21
R^2	0.20	0.22

Notes: Source: OECD and EuroStat. Constant (which in a difference model estimates the average annual change in food deprivation) is estimated but not shown. Standard errors reported in parentheses and are calculated to account for repeated observations within the same country. Poverty line is defined as 60% of median household income. * $p < 0.05$, ** $p < 0.01$

TESTING THE ROLE OF WELFARE REGIMES

As noted, not all countries experiencing an increase in food prices also had rising food deprivation. For example, in Estonia, when the gap between prices and wages declined, food deprivation went down and when the gap increased, food deprivation rose (Figure 3). However, Germany is quite different (Figure 3). Food prices were rising at an accelerated rate above wages in almost every year across this period, and yet, the prevalence of food deprivation steadily declined. The trends in Germany and Estonia suggest the price-wage disconnect does not explain fluctuations in food deprivation alone, but that other factors also influence the affordability of food. Importantly, these two countries have quite different welfare regimes, with Germany an exemplar of the Corporatist welfare regime and Estonia an exemplar of the Eastern European welfare regime, suggesting welfare regime type may help buffer people against rising costs of food and stagnating wages. Thus, next we tested how different social welfare systems moderated the association between food deprivation and the price-wage disconnect.

Figure 4 shows the results of the model comparing each welfare regime (see Web Appendix 2 for full model). We found marked differences in the magnitude of association. The greatest was observed in Mediterranean welfare regimes, where each 1% rise in the price of food over wages corresponded to rise in food deprivation by 0.12 percentage points (95% CI: 0.047 to 0.105). Similar patterns were observed for the Eastern European and Liberal Welfare regimes, albeit to a lesser degree. However, in Social Democratic regimes, this association disappeared (β = -0.003, 95% CI: -0.033 to 0.028).

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Figure 3: The cost of food and food deprivation in Germany and Estonia, 2005 to 2012
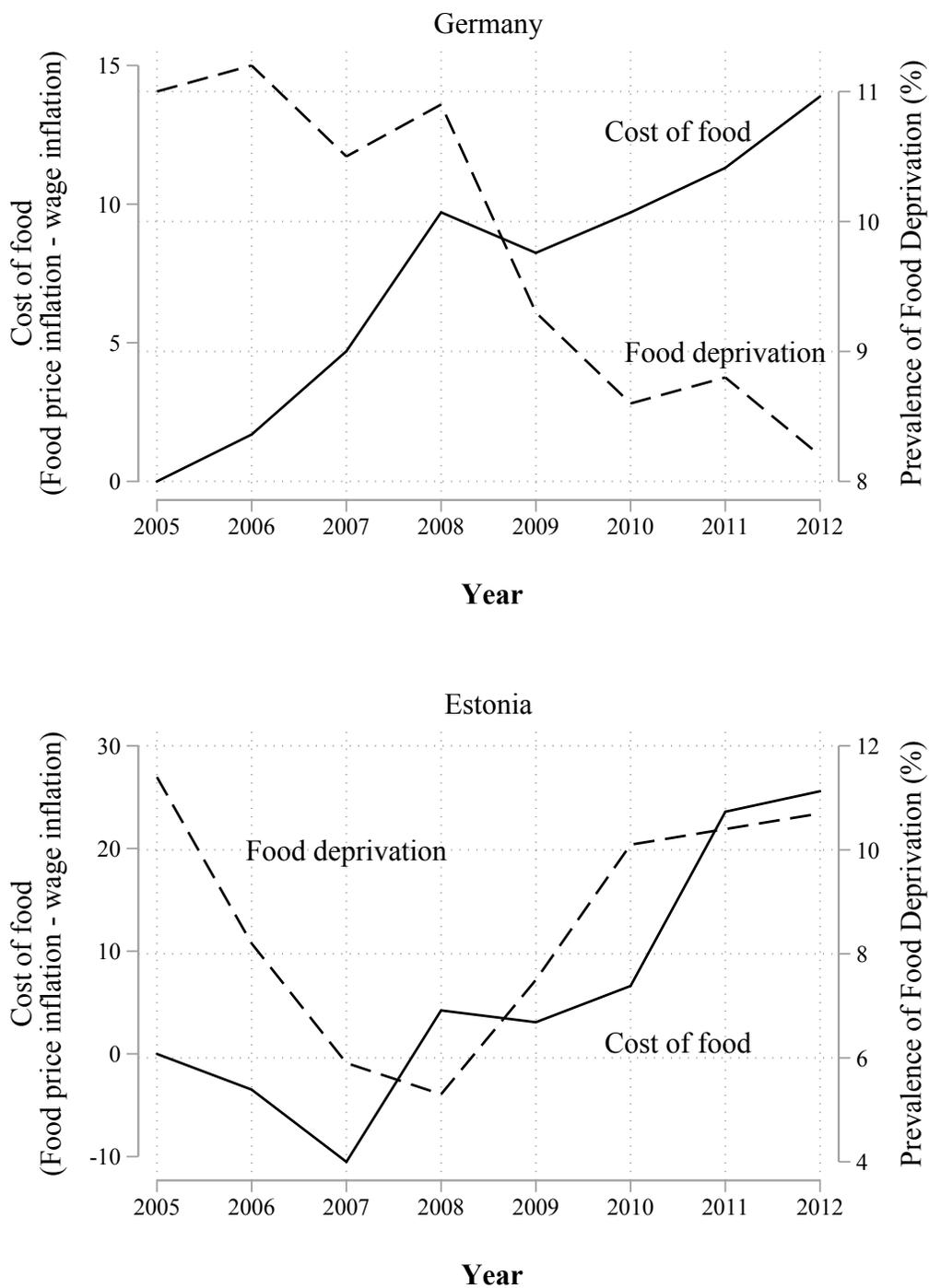
Source: EuroStat and OECD.

Figure 4: The association between the price-wage disconnect and food deprivation across welfare regimes, 2004 to 2012
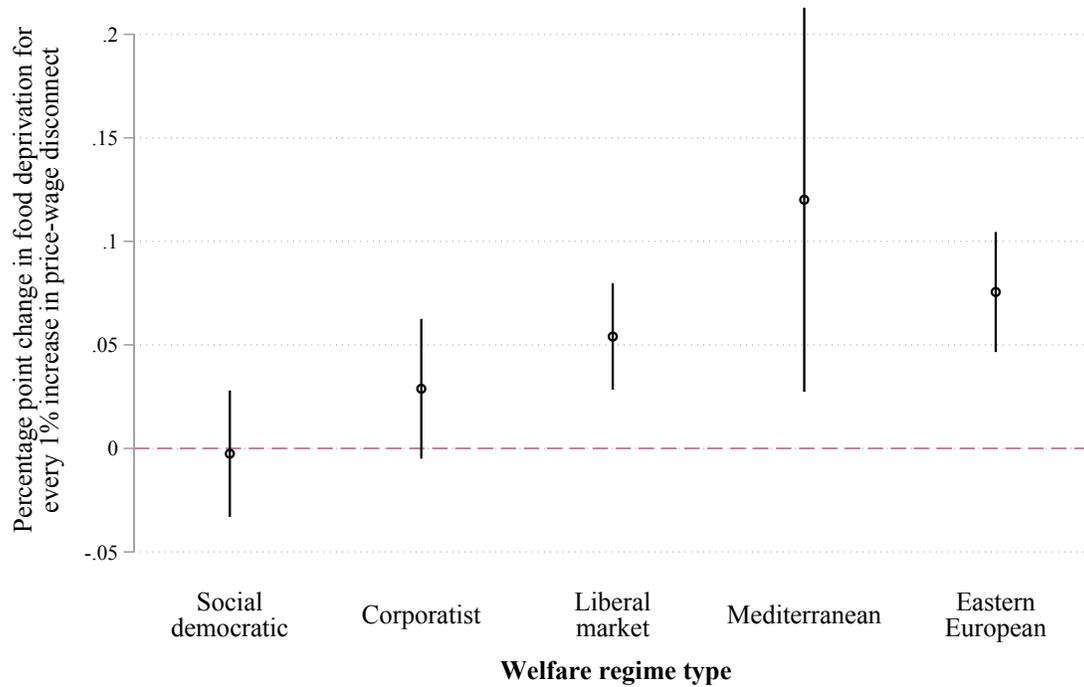
Notes: Results are based on model 4 in Table 1. The only difference is that an indicator of welfare regime type is included in the model and an interaction term is created between this indicator and the price-wage disconnect measure. This model is reported in web appendix 1.

AUSTERITY AND THE RISE IN FOOD DEPRIVATION

Following the Great Recession, some countries, particular those in the Liberal, Mediterranean, and Eastern Europe welfare regimes implemented welfare reforms in an effort to reduce government spending. This may explain why these welfare regimes witnessed rising food deprivation when food prices were increasing faster than wages. To test this possibility, we add a measure of austerity to our model. Here, we define austerity countries as those governments that reduced government expenditure in any two years between 2008 and 2012. Using this definition, austerity countries include Estonia, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, and the United Kingdom, confirming, where possible, this designation using policy documents and other commentaries.[32-35] All other European OECD countries are the non-austerity nations. Even after controlling for this measure of austerity, we find that our results are largely unchanged albeit slightly attenuated (see Web Appendix 3). The association between the price-wage disconnect and food deprivation remains greater in the Liberal, Mediterranean, and Eastern European welfare regimes than the social democratic welfare

regime. Food deprivation also appears to have risen faster in austerity countries than the non-austerity countries (β = 0.63, 95% CI: -0.006 to 1.30), suggesting that austerity may have had an independent effect on food deprivation over and above the effect of the price-wage disconnect.

ROBUSTNESS TESTS

We performed a series of tests to ensure our results were not driven by model specification or our sample. First, we decompose our measure of the disconnect between food prices and wages, estimating whether both are independent correlated with rising food deprivation; finding that both are correlated (Web Appendix 4). Second, housing and energy prices were rising at the same time as food prices in many European countries and so we test whether the disconnect between (1) the cost of housing and wages and (2) energy prices and wages confound the association between food prices, wages, and food deprivation. After controlling for these measures, we observe that the food prices-wages disconnect remains correlated with rising food deprivation (Web Appendix 5).

Third, the disconnect between food prices and wages may also translate into a rise in the share of household budgets dedicated to food on average across the population. Here we replace our measure of food deprivation with this alternative measure of food consumption, finding that the disconnect between food prices and wages is also associated with a greater share of household income spent on food (Web Appendix 6). Importantly, this association likely understates the rise in the share of income spent on food among the poorest households. [18] Fourth, change in the level of relative poverty in the population (defined as 60% of the median income) may also change the relationship between food price shocks, wages, and food deprivation. We therefore add this variable to models, finding that increased relative poverty is associated with more food deprivation but that this does not remove the observed association between the price-wages disconnect and inadequate access to food (Web Appendix 7).

We also exclude outliers from our models, measured as those observations with a standardized residual greater than 2 or less than -2. Our results are largely unchanged (see Web Appendix 8). Next, we tested the possibility of geo-spatial confounding, arising from the fact that the food price shock hit many countries simultaneously. We included time dummies in our model, finding that the association between the price-wage disconnect is attenuated slightly but remains strongly linked to food deprivation (Web Appendix 9).

DISCUSSION

Our statistical models demonstrate that the growing disconnect between rising food prices and stagnating wages is a significant determinant of food deprivation in Europe. Moreover, we find that this growing gap between prices and wages has hit the poorest hardest. However, where European welfare regimes are more generous or stronger, specifically the Social Democrat and Corporatist regimes, the association was mitigated.[30,31] In contrast, in Eastern European, the Mediterranean, and the Liberal (or Anglo-Saxon) welfare regimes, there were strong associations of rising food prices over and above wages with food deprivation.

This rise in food prices has not been driven by any single item of the food basket. Between 2005 and 2012, the price of food and non-alcoholic beverages according to data from EuroStat increased, on average, by 24%. Within this category, bread and cereals rose 29%; meat rose 23%; fish and seafood increased 23%; dairy products rose 23%; oils and fats increased 29%; fruit rose 23%; vegetables increased 26%; and sugar and confectionary rose 24%. This Europe-wide increase in food prices will mask some variation across countries but it is clear that the rise in the cost of food was not concentrated in any particular item of the food basket. Rather food price inflation represents a general rise across most food goods, placing additional pressures on household budgets and forcing households to make difficult choices about what to buy.

As with all cross-national studies, this analysis has several limitations. First, our comparative measure of food deprivation, albeit commonly employed and standardised across nations, is imperfect and likely to understate the extent of households' inability to afford sufficient and adequate food. Although this measure of food deprivation may capture qualitative compromises in food intake arising from resource constraint, it does not capture detailed data on dietary quality and is only a crude marker of insufficient protein intake. Moreover, it does not capture other dimensions of households food insecurity, which include reduced food intake, anxiety about food running out, and individuals going without food.[28] Finally, it fails to adequately specify a time period, thereby likely missing households that may have experienced food hardships in the past 12 months but who are not, at the time of measurement, unable to afford food. [38] Food insecurity can be transient, and this indicator likely overlooks episodes of recent – but not current – food insecurity. Taken together, this Europe-wide measure of food insecurity has the advantage of being harmonised across countries and over time but it likely understates the true level of food insecurity, suggesting our results are conservative estimates of the association between food deprivation and the disconnect between prices and wages.

To fully capture the burden of household food insecurity in populations, it should be measured using a multi-item scale and capture households experiencing instances of food insecurity in the past year, such as that used in the United States and Canada.[39] Future research is needed to develop better EU surveillance to monitor and track the scale of household food insecurity in Europe. Toward this aim, the FAO recently funded the inclusion of an 8-item household food insecurity module on the Gallup World Poll in 2014 and 2015. [40] These data have provided an indication that rates of food insecurity varied from 4 to 20 per cent across Europe in 2014. Yet, they were based on a telephone survey of only 1000 individuals per country, and there is an urgent need for countries to take up standardised monitoring on their own large-scale surveys.[41]

Another limitation is that aggregate data create the possibility of ecological fallacy. However, our models had a high degree of both consistency across different measures and specificity regarding the groups likely to be affected. For example, we observed that the price-wage disconnect was most closely associated with rising food deprivation among people in poverty, whose wages have stagnated and whose household budgets are disproportionally affected by rising food prices.[38] Our findings are also consistent with other data from studies at the individual-level which have shown an impact of rising food prices on households' level food insecurity.[42]

We also note that although welfare regime type have been relatively stable historically, austerity measures and social security reforms following the Great Recessions may have undermined some of the generosity of particular regimes. Since most of these reforms were implemented during or after 2012 it is unlikely that they have confounded our results, and indeed, we found that even after controlling for austerity, our results were robust. [43]

We were also unable to test the role of other potential mediating factors, such as charitable food provisioning and school-based food programmes. To our knowledge these data are not available across countries and over time. Where some data do exist they are also incomplete, focussing on large national food charity networks which will underestimate the prevalence of such services. More work is needed to understand how these alternative food responses may moderate the effect of the disconnect between prices and wages on household food insecurity.

Our studies point to several directions for future research. One is developing better monitoring and understanding of the food-wage disconnect. Future research is needed to identify those policies which can combat hunger, potentially through interventions that make food more affordable or increase wages. For example, indexing benefit support to the cost of living may be an important way to protect households from food price increases. Similarly, Living Wage commitments could ensure that wages rise in tandem with living costs. Further, introducing a basic income may eliminate (or at least radically reduce) food insecurity for those both inside and outside the formal labour market as long as it was indexed to the cost of living. [44,45] There is body of research exploring policy interventions in relation to household food insecurity in North America,[44,46-48] but to our knowledge, little has been done in this regard in Europe. Similarly, while studies have explored what impact charitable food assistance has on household food insecurity in North America,[49] given the recent rapid expansion of food charity in the EU, [15,43] there is an urgent need to understand the effectiveness of charitable food interventions on food insecurity in this context.

Second, as highlighted, more needs to be done to understand the extent to which households are unable to afford adequate and sufficient food in Europe using validated measures of household food insecurity and in detailed national household surveys, and in turn, the consequences of this problem for health and nutritional status.

These findings also have important policy implications. They show that, especially during periods of economic hardship, it is important to place priority on the food security of vulnerable groups. This can be compounded, or alleviated, by social security systems, such as a basic income, as well as by external forces outside control of policymakers.[50] Several events suggest imminent change, for better and for worse. One is that there are signs of a slow return of economic growth in Europe which, if it leads to modest increases in real wages, could mitigate rising household food insecurity. At the same time, a secular decline in oil prices has contributed to falling food prices, reducing the price-wage disconnect. Yet these positive trends may be counteracted by deep austerity measures in Europe, as governments continue to scale back social protection systems. What is clear is that the inability of households to afford basic foods in Europe indicates a massive problem for countries where social security is weak, especially in the face of food price shocks.

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WEB APPENDIX

Web Appendix 1: Decomposition of the explained variance

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Web Appendix 9: Food deprivation and the price-wage disconnect in 21 EU countries, including time dummies, 2004 and 2012.

Web Appendix 1: Decomposition of the explained variance

Covariates	Percentage point change in food deprivation (%)	
	Standardized coefficient	Shapley % of R^2
Per 1% rise in food prices above rise in wages	0.38	54.32%
$100 annual increase in GDP per capita	0.23	7.09%
1ppt rise in unemployment rate	0.37	38.59%
Observations	166	
Countries	21	
R^2	0.26	

Notes: Decomposition of the explained variance is conducted according to the Shapley method.

Web Appendix 2: The price-wage disconnect and food deprivation by welfare regime, full model

Covariates	Percentage point change in food deprivation (%) (1)
Per 1% rise in food prices above rise in wages	-0.0025
	(0.015)
Welfare regime (baseline Social democratic)	
Corporatist	-0.20
	(0.15)
Liberal-market	0.22
	(0.31)
Mediterranean	-0.72**
	(0.12)
Eastern European	-1.78**
	(0.46)
Per 1% rise in food prices above rise in wages x welfare regime	
Corporatist	0.031
	(0.024)
Liberal-market	0.057*
	(0.019)
Mediterranean	0.12*
	(0.044)
Eastern European	0.078**
	(0.021)
$100 annual increase in GDP per capita	0.022
	(0.012)
1ppt rise in unemployment rate	0.26
	(0.14)
Observations	166
Countries	21
R^2	0.42

Source: OECD and EuroStat. Constant (which in a difference model estimates the average annual change in food deprivation) is estimated but not shown. Standard errors reported in parentheses and are calculated to account for repeated observations within the same country. * $p < 0.05$, ** $p < 0.01$

Web Appendix 3: The price-wage disconnect and food deprivation by welfare regime, full model and adjusted for austerity

Covariates	Percentage point change in food deprivation (%)
	(1)
Per 1% rise in food prices above rise in wages	0.00055
	(0.015)
Welfare regime (baseline Social democratic)	
Corporatist	-0.28
	(0.17)
Liberal-market	-0.53
	(0.35)
Mediterranean	-0.91**
	(0.16)
Eastern European	-1.80**
	(0.46)
Per 1% rise in food prices above rise in wages x welfare regime	
Corporatist	0.023
	(0.022)
Liberal-market	0.048*
	(0.017)
Mediterranean	0.10*
	(0.042)
Eastern European	0.065**
	(0.023)
$100 annual increase in GDP per capita	0.025
	(0.012)
1ppt rise in unemployment rate	0.23
	(0.14)
Announced and begun implementing austerity (Yes = 1)	0.63
	0.30
Observations	166
Countries	21
R^2	0.41

Source: OECD and EuroStat. Constant (which in a difference model estimates the average annual change in food deprivation) is estimated but not shown. Standard errors reported in parentheses and are calculated to account for repeated observations within the same country. * $p < 0.05$, ** $p < 0.01$

Web Appendix 4: Food deprivation, poverty, and decomposing the price-wage disconnect in 21 EU countries, 2004 and 2012.

Covariates	Percentage point change in food deprivation (%)	
	(1)	(2)
Per 1% rise in food prices above rise in wages	0.060**	—
	(0.014)	
$100 annual increase in GDP per capita	0.029*	0.029*
	(0.014)	(0.014)
1ppt rise in unemployment rate	0.38**	0.39**
	(0.11)	(0.11)
Per 1% rise in food prices	—	0.059**
		(0.015)
Per 1% rise in wages	—	-0.068*
		(0.025)
Observations	166	166
Countries	21	21
R^2	0.28	0.28

Source: OECD and EuroStat. Constant (which in a difference model estimates the average annual change in food deprivation) is estimated but not shown. Standard errors reported in parentheses and are calculated to account for repeated observations within the same country. * $p < 0.05$, ** $p < 0.01$

Web Appendix 5: Food deprivation, the price-wage disconnect across food, energy, and housing in 21 EU countries, 2004 and 2012.

Covariates	Percentage point change in food deprivation (%)	
	(1)	(2)
Per 1% rise in food prices above rise in wages	0.060**	0.060*
	(0.014)	(0.025)
$100 annual increase in GDP per capita	0.029*	0.029*
	(0.014)	(0.014)
1ppt rise in unemployment rate	0.38**	0.38**
	(0.11)	(0.12)
Per 1% rise in food prices	—	0.0033
		(0.011)
Per 1% rise in wages	—	-0.0073
		(0.014)
Observations	166	166
Countries	21	21
R^2	0.28	0.28

Source: OECD and EuroStat. Constant (which in a difference model estimates the average annual change in food deprivation) is estimated but not shown. Standard errors reported in parentheses and are calculated to account for repeated observations within the same country. Energy prices include heating, coal, gas, and electricity. Cost of housing includes housing services as well as rents. * $p < 0.05$, ** $p < 0.01$

Web Appendix 6: Share of income spent on food and the price-wage disconnect in 21 EU countries, 2004 and 2012.

Covariates	Percentage point change in share of household income spent of food (%)		
	(1)	(2)	(3)
Per 1% rise in food prices above rise in wages	0.071**	0.0060*	0.0062**
	(0.0024)	(0.0023)	(0.0021)
$100 annual increase in GDP per capita		-0.0051	- 0.0019
		(0.0030)	(0.0020)
1ppt rise in unemployment rate			0.061**
			(0.015)
Observations	166	166	166
Countries	21	21	21
R^2	0.035	0.062	0.11

Notes: Source: OECD and EuroStat. Constant (which in a difference model estimates the average annual change in food deprivation) is estimated but not shown. Standard errors reported in parentheses and are calculated to account for repeated observations within the same country. * $p < 0.05$, ** $p < 0.01$

Web Appendix 7: Food deprivation, relative poverty, and the price-wage disconnect in 21 EU countries, 2004 and 2012.

Covariates	Percentage point change in food deprivation (%)	
	(1)	(2)
Per 1% rise in food prices above rise in wages	0.060**	0.058**
	(0.014)	(0.014)
$100 annual increase in GDP per capita	0.029*	0.029*
	(0.014)	(0.012)
1ppt rise in unemployment rate	0.38**	0.37**
	(0.11)	(0.11)
1ppt rise in relative poverty (60% of median income)	—	0.36*
		(0.16)
Observations	166	166
Countries	21	21
R^2	0.28	0.31

Source: OECD and EuroStat. Constant (which in a difference model estimates the average annual change in food deprivation) is estimated but not shown. Standard errors reported in parentheses and are calculated to account for repeated observations within the same country. Energy prices include heating, coal, gas, and electricity. Cost of housing includes housing services as well as rents. * $p < 0.05$, ** $p < 0.01$

Web Appendix 8: Food deprivation and the price-wage disconnect in 20 EU countries (excluding outliers), 2004 and 2012.

Covariates	Percentage point change in food deprivation (%)	
	Include outliers	Excludes outliers
Per 1% rise in food prices above rise in wages	0.060**	0.052**
	(0.014)	(0.011)
$100 annual increase in GDP per capita	0.029*	0.024
	(0.014)	(0.012)
1ppt rise in unemployment rate	0.38**	0.39**
	(0.11)	(0.11)
Observations	166	166
Countries	21	21
R^2	0.26	0.28

Source: OECD and EuroStat. Constant (which in a difference model estimates the average annual change in food deprivation) is estimated but not shown. Standard errors reported in parentheses and are calculated to account for repeated observations within the same country. Outliers are defined as those observations with a standardized residual greater than $|2|$. * $p < 0.05$, ** $p < 0.01$

Web Appendix 9: Food deprivation and the price-wage disconnect in 21 EU countries, including time dummies, 2004 and 2012.

Covariates	Percentage point change in food deprivation (%)	
	(1)	(2)
Per 1% rise in food prices above rise in wages	0.060**	0.046**
	(0.014)	(0.013)
$100 annual increase in GDP per capita	0.029*	0.010
	(0.014)	(0.013)
1ppt rise in unemployment rate	0.38**	0.44**
	(0.11)	(0.14)
Time dummies included	N	Y
Observations	166	166
Countries	21	21
R^2	0.28	0.33

Source: OECD and EuroStat. Constant (which in a difference model estimates the average annual change in food deprivation) is estimated but not shown. Standard errors reported in parentheses and are calculated to account for repeated observations within the same country. In model 2, the constant becomes the first time dummy (i.e., 2004). * $p < 0.05$, ** $p < 0.01$