

# Economic Insecurity and the Rise of the Right\*

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## Abstract

Economic insecurity has attracted growing attention in social, academic and policy circles. However, there is no consensus as to its precise definition. Intuitively, economic insecurity is multifaceted, making any comprehensive formal definition subsuming all possible aspects extremely challenging. We propose simplified a more-simplified model and then characterize a class of individual economic-insecurity measures based on variations over time in economic resources. We then apply our economic-insecurity measure to data on political preferences. In US, UK and German panel data, economic insecurity predicts political participation (the intention to vote) and notably greater support for parties on the right wing of the political spectrum. We in particular find that, conditional on current economic resources, economic insecurity predicts greater support for both Donald Trump before the 2016 US presidential election and the UK leaving the European Union in the 2016 Brexit referendum. *JEL Classification Nos.:* D63, D72, I32.

**Keywords:** Economic index numbers; Insecurity; Political participation; Right-leaning political parties.

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# 1 Introduction

Political scientists have traditionally emphasized the social and institutional origins of political preferences, with most models assuming that individuals convert information from their environment into evaluations of political objects. See Druckman and Lupia (2000) for a review of the memory-based and online models that are relevant in this literature. At the same time, research in psychology has underlined that personality characteristics predict political attitudes, as pointed out by Malka, Soto, Inzlicht and Lelkes (2014). For instance, as outlined by Jost, Glaser, Kruglanski, and Sulloway (2003) and Jost, Napier, Thorisdottir, Gosling, Palfai and Ostafin (2007), the needs for security and to be able to manage uncertainty are strong predictors of conservatism; earlier work along these lines emphasizing aversion to novelty and worries about security can be found in Adorno, Frenkel-Brunswik, Levinson and Sanford (1950) and Rokeach (1960), for example. Using data from the World Values Survey, Malka *et al.* (2014) recently showed that valuing elements such as conformity and security predicts ideological self-placement on the political right in developed non-Eastern European nations.

Economic insecurity has appeared with increasing frequency in policy debates and academic research. For example, the Great Recession, with its associated job instability and job losses for many, marked decline of the middle class, and numerous home foreclosures along with stagnant housing markets, has had a profound effect on the lives of many. In consequence, household expectations regarding their financial situation, savings, the threat of future unemployment and the future general economic outlook have all dropped sharply, as reflected for example in the Consumer Economic Sentiment indicator of the European Commission. There is by now widespread agreement that economic insecurity, reflecting amongst others the pace of technological change, aging populations, and migration, has a considerable impact on the individuals concerned. Existing work has proposed links between insecurity and obesity (Smith, Stillman and Craig, 2013), suicide rates (Reeves, McKee and Stuckler, 2014), mental health (Rohde, Tang, Osberg and Rao, 2016) and gun violence in US schools (Pah, Hagan, Jennings, Jan, Albrecht, Hockenberry and Amaral, 2017). A related strand of literature has considered potential transmission effects from parents to children (Kalil, 2013, and Clark, D’Ambrosio and Barazzetta, 2018). Economic insecurity has also been proposed as a key driver of election outcomes: Inglehart and Norris (2016) and Walley (2017) adopt a qualitative approach and relate the rise of populism to the recent economic and policy transformations in post-industrial economies and their consequences on economic insecurity.

Our paper contributes to this broad area of research by first proposing and characterizing a measure of economic insecurity, and then asking how economic insecurity affects political preferences. To the best of our knowledge, there is no quantitative evidence of this type to be found in the existing literature. Based on research in psychology and political science, we expect economic insecurity to be associated with a greater need for security, which translates into a higher probability of supporting more conservative political parties.

Economic insecurity is clearly multi-faceted, and a comprehensive formal definition subsuming all possible aspects is unlikely to appear in the foreseeable future. Although it would evidently be desirable to take many variables into consideration, we here refrain from this approach as it seems extremely difficult—if not impossible—to aggregate these potentially very diverse attributes as many of them appear to be incommensurable. For instance, we find it difficult to formulate meaningful trade-offs between variations in wealth over time and sectoral unemployment rates or access to health care, say. We conclude that at least in the first instance it is too ambitious to propose a single indicator aggregating all attributes. If a number of (possibly incommensurable) variables have to be compared, a more modest approach based on dominance criteria may be more suitable and we do not pursue this issue further here.

Although there is a relatively small literature on the measurement of economic insecurity, its political, economic and social relevance calls for more investigation. The few attempts to construct measures of economic insecurity in the literature include: (i) the Economic Security Index by Hacker, Huber, Rehm, Schlesinger and Valletta (2010); (ii) proposals by the International Labour Organization (2004) and Osberg and Sharpe (2009); (iii) the index in Rohde, Tang and Rao (2014). The respective measures produced can broadly be described as (i) the fraction of the population who experience a drop in disposable family income of at least 25% from the previous year and lack an adequate financial safety net; (ii) a weighted average of the ‘scores’ of different attributes achieved as a percentage of the population; and

(iii) the volatility arising from incomes dropping below the household’s overall trend. The Business Dictionary ([www.businessdictionary.com](http://www.businessdictionary.com)) defines economic security as “A situation of having a stable source of financial income that allows for the on-going maintenance of one’s standard of living currently and in the near future.” See Osberg (2015; 2018) and Rohde and Tang (2018) for a thorough discussion and excellent surveys.

Our focus is on *individual* measures of insecurity and how these relate to political preferences. From a theoretical perspective, measures of insecurity applicable to entire societies can be obtained in a second step by aggregating the respective individual levels employing a mean (the arithmetic mean, for instance). The crucial problem is that of obtaining an individual insecurity measure in the first place, and that is what we focus on here.

We in particular consider how an individual is able to deal with any economic changes that may lie ahead. It seems clear that past gains and losses in resources determine the confidence that an individual will have today regarding her or his ability to get by in the future. The measures of individual insecurity we propose thus have as their domain resource streams of varying lengths. The length of these streams is not assumed to be fixed, as individuals are of different (economic) ages in a given time period. Moreover, we allow resources to be negative, which is a realistic assumption.

Our first step is to provide a precise definition of a measure of economic insecurity in this setting. We say that a mapping that assigns numerical values to resource streams serves as an individual measure of economic insecurity if it has two basic properties. The first ensures that a gain (loss) from the earliest period under consideration to the following period is associated with a lower level (higher) of insecurity as compared to the situation where no such change occurs. The second fundamental property is that a gain (loss) of a given magnitude reduces (increases) economic insecurity more the closer this gain (loss) is to the present: more recent experiences carry a greater weight in determining insecurity than those further in the past. We think of the conjunction of these two properties as a suitable definition of an individual insecurity index. This is analogous to the standard definition of an inequality measure as an S-convex function—that is, a symmetric function that respects the Pigou-Dalton principle of progressive transfers. As with the measurement of income inequality, the defining postulates are compatible with a wide range of possible indices. Further properties are thus needed in order to produce more concrete proposals. Again, as is the case for essentially all social index numbers, it would be too much to hope for a single measure that is universally accepted as being the ‘best’ and, therefore, some additional properties are bound to be more controversial than the defining postulates.

Our main theoretical result is the characterization of a class of individual insecurity measures, the members of which are based on geometrically-discounted resource differences. Only three parameters need to be chosen: a discount factor that is common to past gains and past losses, and two parameters that express the relative importance of aggregate losses and aggregate gains. A further result employs an additional axiom that gives priority to past losses over past gains, thereby providing a further restriction on the three parameters.

As is evident from our earlier remarks, we choose an axiomatic approach to the measurement of economic insecurity by formulating desirable properties of an index of individual insecurity, and identifying the class of measures that satisfy all of these requirements. See Thomson (2001) for a thorough discussion of the usefulness of the axiomatic approach in numerous economic models.

We then apply our insecurity measure to one of the current areas of research in social science: political preferences. We first take two of the longest-running large-scale panel datasets and show that economic insecurity significantly increases the probability of supporting *some* political party (and thus reduces abstention) in both the UK and Germany. We then demonstrate that this greater participation is not equally shared: economic insecurity increases the support for right-leaning parties (the Conservatives in the UK and the CDU/CSU in Germany), and to a lesser extent center parties (the FDP in Germany). In contrast, support for left-leaning parties falls with economic insecurity (especially in West Germany). These results hold in panel regressions controlling for current economic resources, and for all of the time periods considered (and are hence independent of the incumbent government). They are stronger for the married and those with children.

We then turn to two recent notable political events: the 2016 Presidential election in the United

States and the 2016 United Kingdom European Union membership (“Brexit”) referendum. Using data from the Understanding American Society and the UK Understanding Society surveys, our economic insecurity measure is significantly correlated with voting intentions: greater economic insecurity predicts more support for Donald Trump and Brexit.

The remainder of the paper is organized as follows. Section 2 introduces and axiomatically characterizes our measure of economic insecurity. The empirical relationship between insecurity and voting behavior appears in Section 3. We first show that economic insecurity predicts a greater intention to vote and more support for parties on the right of the political spectrum using data from two of the longest-running annual panel datasets, the British Household Panel Survey (BHPS) and the German Socio-Economic Panel (SOEP). We then turn to the two major political results of 2016: the election of Donald Trump and Brexit, showing that our economic-insecurity measure predicts both. Last, our concluding remarks follow in Section 4.

## 2 The Economic Insecurity Measure

### 2.1 Preliminaries

We use  $\mathbf{1}_m$  to denote the vector consisting of  $m \in \mathbb{N} \setminus \{1\}$  ones. For any  $T \in \mathbb{N}$ , let  $\mathbb{R}^{(T)}$  be the  $(T + 1)$ -dimensional Euclidean space with components labeled  $(-T, \dots, 0)$ . Zero is interpreted as the current period and  $T$  is the number of past periods taken into consideration. We allow  $T$  to vary as people alive in the current period may have been born (or have become economic agents) in different periods. A measure of individual insecurity is a sequence of functions  $I = \langle I^T \rangle_{T \in \mathbb{N}}$  where, for each  $T \in \mathbb{N}$ ,  $I^T: \mathbb{R}^{(T)} \rightarrow \mathbb{R}$ . This index assigns a degree of insecurity to each individual resource stream  $x = (x_{-T}, \dots, x_0) \in \mathbb{R}^{(T)}$ . We allow resources to be negative. As can be seen from these definitions, we restrict attention to streams that involve at least one past period in addition to the current period; this is because our indices are based on pairwise differences.

In an earlier contribution, Bossert and D’Ambrosio (2013) propose and characterize classes of linear measures of insecurity that bear a formal resemblance to the single-series Gini and single-parameter Gini inequality measures (see, for instance, Donaldson and Weymark, 1980, Weymark, 1981, and Bossert, 1990). The application of these Gini-type measures requires the choice of numerous parameter values. In particular, the main result in Bossert and D’Ambrosio (2013) involves two sequences of parameters—one parameter for past gains and one for past losses for each time period under consideration. Even if attention is restricted to a finite number of periods, this can amount to a rather formidable task. Thus, the flexibility afforded by this large class comes at a price: without further systematic restrictions, it may be difficult to make a sound choice of what may be considered ‘suitable’ parameter values. Moreover, the measures characterized in Bossert and D’Ambrosio (2013) fail to satisfy stationarity, a standard property in intertemporal economic models. Stationarity implies that no significance is attached to the way in which time periods are numbered, and it is necessary to avoid behaviour where, with the mere passage of time, plans that were optimal yesterday need no longer be optimal today.

Our first result identifies the class of measures that can be expressed as a weighted sum of all period-to-period pairwise gains and losses, where the weights associated with the losses can differ from those assigned to the gains. Moreover, the weights are such that more recent gains (losses) are given higher weights than those that occur farther in the past. In contrast, the measures of Bossert and D’Ambrosio (2013) are such that the current level of the resource is added to the weighted sum of gains and losses. This is an important and significant difference: as a consequence, some members of our new class of measures are compatible with stationarity, whereas the measures in Bossert and D’Ambrosio (2013) are not.

To state our main result, we endow our model with more structure. In particular, we use a suitable formulation of the stationarity property that is familiar from the literature on intergenerational choice and a condition that we refer to as resource-variation monotonicity. The monotonicity property has an intuitive interpretation in the sense that it links the notion of economic insecurity to certain ‘first-

down-then-up' variations in economic resources, indicating the ability to recover from some losses, and to 'first-up-then-down' movements which are bound to induce a more pessimistic outlook. This feature will become clear once the property is defined formally later in the paper.

To begin with, we introduce two axioms that we consider essential for a measure of individual insecurity. The monotonicity axiom ensures that a gain in resources from the earliest period under consideration to the next is associated with a lower level of insecurity than a situation in which no change occurs between these two periods. Likewise, a loss in resources that occurs from the earliest period to the following produces greater insecurity than no change. This property clearly captures the notion that individual insecurity is based on gains and losses.

**Gain-loss monotonicity.** For all  $T \in \mathbb{N}$ , for all  $x \in \mathbb{R}^{(T-1)}$  and for all  $a \in \mathbb{R}_{++}$ ,

$$I^T(x_{-(T-1)} - a, x) < I^T(x_{-(T-1)}, x) < I^T(x_{-(T-1)} + a, x).$$

The second fundamental axiom ensures that a gain (loss) of a given magnitude reduces (increases) insecurity more the closer it is to the present. Intuitively, this property imposes that more recent experiences carry more weight than those that took place further in the past. This requirement appears very natural in our context.

**Proximity monotonicity.** For all  $T \in \mathbb{N} \setminus \{1\}$ , for all  $t \in \{1, \dots, T-1\}$  and for all  $x \in \mathbb{R}^{(T)}$ ,

$$\begin{aligned} I^T(x_{-T}, \dots, x_{-(t+1)}, x_{-(t+1)}, x_{-(t-1)}, \dots, x_0) &\geq I^T(x_{-T}, \dots, x_{-(t+1)}, x_{-(t-1)}, x_{-(t-1)}, \dots, x_0) \\ &\Leftrightarrow x_{-(t+1)} \geq x_{-(t-1)}. \end{aligned}$$

We propose to define an index of individual economic insecurity as a sequence of functions  $I = \langle I^T \rangle_{T \in \mathbb{N}}$  that satisfies gain-loss monotonicity and proximity monotonicity. In addition to these fundamental properties, we introduce some further axioms that are of considerable intuitive appeal in our setting.

Homogeneity is a standard requirement in the theory of economic index numbers. It demands that if a resource stream is multiplied by a positive constant, insecurity is multiplied by the same constant.

**Homogeneity.** For all  $T \in \mathbb{N}$ , for all  $x \in \mathbb{R}^{(T)}$  and for all  $b \in \mathbb{R}_{++}$ ,

$$I^T(bx) = bI^T(x).$$

Our next property is that of translation invariance. It requires that if the same amount of the resource under consideration is added to the existing levels of the resource available in each period, the value of the insecurity measure is unchanged. As for homogeneity, translation invariance is well-established in the literature.

**Translation invariance.** For all  $T \in \mathbb{N}$ , for all  $x \in \mathbb{R}^{(T)}$  and for all  $c \in \mathbb{R}$ ,

$$I^T(x + c\mathbf{1}_{T+1}) = I^T(x).$$

The final axiom used in our first result is a quasilinearity condition, establishing a link between insecurity comparisons involving resource streams of different lengths. We use the term quasilinearity because of the structural similarity with quasilinear utility functions in consumer-demand theory; see, for example, Varian (1992, p. 154). In the insecurity context, quasilinearity requires that the insecurity  $I^T(x)$  associated with a resource stream  $x \in \mathbb{R}^{(T)}$  can be expressed as a quasilinear function involving the  $T$  most recent resource levels  $(x_{-(T-1)}, \dots, x_0)$  and the resource difference  $x_{-T} - x_{-(T-1)}$ . The property is a variant of a well-known axiom phrased in the context of economic insecurity.

**Quasilinearity.** For all  $T \in \mathbb{N} \setminus \{1\}$ , there exists a function  $F^T: \mathbb{R}^2 \rightarrow \mathbb{R}$  such that, for all  $x \in \mathbb{R}^{(T)}$ ,

$$I^T(x) = I^{T-1}(x_{-(T-1)}, \dots, x_0) + F^T(x_{-T} - x_{-(T-1)}).$$

The main contribution of this paper lies in the use of two further axioms. The first is stationarity, the second is a monotonicity property with respect to specific variations in the resources available to an agent.

**Stationarity.** For all  $r \in \mathbb{N}_0$ , there exists an increasing function  $G^r: \mathbb{R} \rightarrow \mathbb{R}$  such that, for all  $t \in \mathbb{N}_0$  and for all  $p, q, s \in \mathbb{R}$ ,

$$I^{t+r+2}(p, q, s\mathbf{1}_{t+r+1}) = G^r(I^{t+2}(p, q, s\mathbf{1}_{t+1})).$$

Stationarity requires that the insecurity comparison associated with two specific streams is unchanged if the two resource levels  $p$  and  $q$  are shifted  $r$  periods into the past and the additional periods are assigned resource levels of  $s$ . For instance, if  $t = 1$  and  $s = 0$ , the property requires that

$$I^{3+r}(p, q, 0, 0, \mathbf{0}_r)$$

can be expressed as an ( $r$ -dependent) increasing transformation  $G^r$  of

$$I^3(p, q, 0, 0).$$

Clearly, the axiom could be strengthened to include more complex streams but, for simplicity and ease of exposition, we state the above weak version that is sufficient for our purposes.

Our second additional axiom is the following monotonicity property.

**Resource-variation monotonicity.** For all  $t \in \mathbb{N}$ , for all  $p \in \mathbb{R}$  and for all  $q \in \mathbb{R}_{++}$ ,

$$\begin{aligned} I^{t+2}(p, p, p+q, p\mathbf{1}_t) &> I^{t+2}(p, p+q, p\mathbf{1}_{t+1}) > I^{t+2}(p\mathbf{1}_{t+3}) > \\ I^{t+2}(p, p-q, p\mathbf{1}_{t+1}) &> I^{t+2}(p, p, p-q, \mathbf{1}_t). \end{aligned} \tag{1}$$

Loosely speaking, resource-variation monotonicity is motivated as follows. First, it is assumed that a first-up-then-down move of a given magnitude in two consecutive periods involves an increase in insecurity, whereas the reverse is true for an analogous first-down-then-up move. The motivation here is straightforward: a ceteris-paribus rise in resources followed by a fall leaves the agent with a net increase of insecurity as the more recent move is associated with a downwards trajectory, whereas a down-and-up move rather produces confidence due to the recovery aspect of this movement in resources. Moreover, if a rise in resources in a given period is followed by a fall of the same magnitude in the next, the insecurity associated with this stream exceeds that of a stream that shifts this up-and-down move one period into the past. Analogously, if a fall in resources is followed by a rise of the same size in the next period, shifting this down-and-up move one period into the past increases insecurity. These hypotheses reflect that more recent experiences are more influential than those that occurred farther in the past. As is the case for stationarity, we limit the scope of the axiom to a relatively small class of cases (which is sufficient for our purposes) for simplicity and ease of exposition. See Figures 1 to 5 for an illustration of the axiom with  $p = 0$  and  $q = 1$ , where the resource streams are listed in decreasing order of insecurity. That is, the stream in Figure 1 has more insecurity than that in Figure 2 which, in turn, has more insecurity than that in Figure 3, and so on.

The axiom of resource-variation monotonicity does not easily translate to a more general setting. For instance, it is not evident that a recovery from serious physical injuries necessarily boosts an agent's confidence and, therefore, we do not advocate this property as a general principle, but instead underline that it is plausible and intuitively appealing in the current economic-insecurity setting.

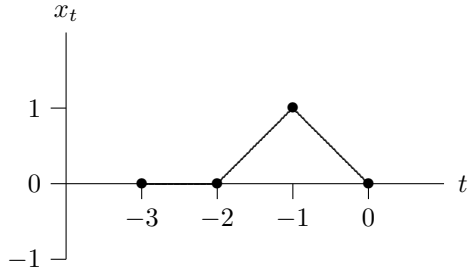


Figure 1: The resource stream  $x^1 = (0, 0, 1, 0)$ .

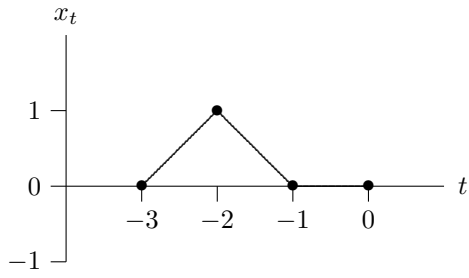


Figure 2: The resource stream  $x^2 = (0, 1, 0, 0)$ .

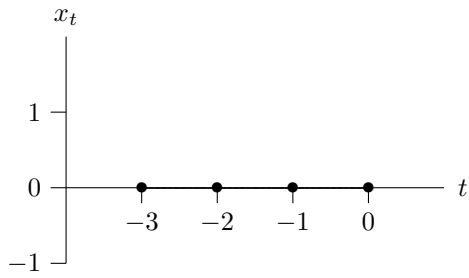


Figure 3: The resource stream  $x^3 = (0, 0, 0, 0)$ .

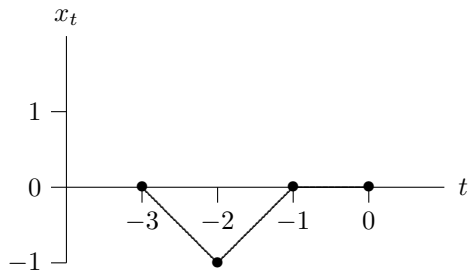


Figure 4: The resource stream  $x^4 = (0, -1, 0, 0)$ .

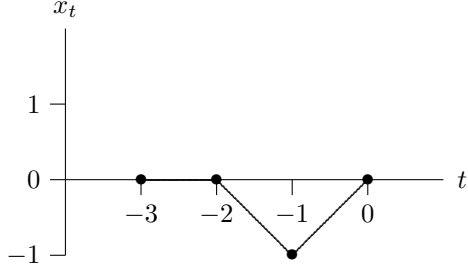


Figure 5: The resource stream  $x^5 = (0, 0, -1, 0)$ .

## 2.2 Theoretical Results

We first identify the insecurity measures that satisfy our first five axioms of gain-loss monotonicity, proximity monotonicity, homogeneity, translation invariance and quasilinearity. All proofs can be found in Appendix A.

**Theorem 1.** *A measure of individual economic insecurity  $I$  satisfies gain-loss monotonicity, proximity monotonicity, homogeneity, translation invariance and quasilinearity if and only if there exist decreasing functions  $\ell: \mathbb{N} \rightarrow \mathbb{R}_{++}$  and  $g: \mathbb{N} \rightarrow \mathbb{R}_{++}$  such that, for all  $T \in \mathbb{N}$  and for all  $x \in \mathbb{R}^{(T)}$ ,*

$$I^T(x) = \sum_{\substack{t \in \{1, \dots, T\}: \\ x_{-t} > x_{-(t-1)}}} \ell(t) (x_{-t} - x_{-(t-1)}) + \sum_{\substack{t \in \{1, \dots, T\}: \\ x_{-t} < x_{-(t-1)}}} g(t) (x_{-t} - x_{-(t-1)}). \quad (2)$$

Independent of the choice of the functions  $\ell$  and  $g$ , any constant resource stream  $s\mathbf{1}_{T+1}$  with  $s \in \mathbb{R}$  and  $T \in \mathbb{N}$  is assigned an insecurity value of zero according to the indices described in Theorem 1. This observation follows immediately as all of the period-to-period differences are zero in this case. As noted above, these measures differ from those characterized in Bossert and D'Ambrosio (2013). In particular, in the indices in the latter a constant stream  $s\mathbf{1}_{T+1}$  has a level of insecurity of minus  $s$ —that is, (ceteris-paribus) higher current resources are associated with lower insecurity values. That the classes proposed here do not possess this property may be considered a shortcoming. However, this is not necessarily the case, depending on the interpretation of the resource variable. If  $x$  is a wealth stream, the current level of wealth can be seen as a buffer stock that can be used to absorb adverse events. This is no longer obvious if the resource under consideration is income which is typically considered as a flow rather than a stock, and thus the argument would seem to have much less force. Moreover, we reiterate that the indices of Bossert and D'Ambrosio (2013) are not stationary. There is thus a trade-off to be taken into account when assessing their merits relative to the present proposal.

The measures identified in the above theorem have a simple structure. They are based on the sum of weighted period-to-period gains and losses, where the weights assigned to losses and those assigned to gains (given by the functions  $\ell$  and  $g$ ) can be different. Moreover, the only additional restriction imposed on these weight functions is that more recent periods are assigned higher weights than those farther in the past. Clearly, this allows for a rather large class of measures and the selection of suitable weights can present a formidable task. Perhaps more importantly, some of these weight functions are associated with rather counter-intuitive properties such as time-inconsistent choices. It is with these considerations in mind that we narrow down this class by imposing stationarity and resource-variation monotonicity.

The following result characterizes insecurity measures that employ geometric discounting. Not surprisingly, geometric discounting follows from stationarity. The relative weights of aggregate losses and gains are expressed by means of the positive parameters  $\ell_0$  and  $g_0$ . It is worth emphasizing that the

discount factor  $\delta$  that applies to losses must be the same as that attached to gains. Furthermore, the possible values of  $\delta$  must be below the smaller of the two ratios  $\ell_0/g_0$  and  $g_0/\ell_0$ , the other two parameters of the class of insecurity measures characterized below. These parameter restrictions result from resource-variation monotonicity. Clearly, higher values of  $\delta$  correspond to a greater importance being attached to previous experiences.

**Theorem 2.** *A measure of individual economic insecurity  $I$  satisfies gain-loss monotonicity, proximity monotonicity, homogeneity, translation invariance, quasilinearity, stationarity and resource-variation monotonicity if and only if there exist  $\ell_0, g_0 \in \mathbb{R}_{++}$  and  $\delta \in (0, \min\{\ell_0/g_0, g_0/\ell_0\})$  such that, for all  $T \in \mathbb{N}$  and for all  $x \in \mathbb{R}^{(T)}$ ,*

$$I^T(x) = \ell_0 \sum_{\substack{t \in \{1, \dots, T\}: \\ x_{-t} > x_{-(t-1)}}} \delta^{t-1} (x_{-t} - x_{-(t-1)}) + g_0 \sum_{\substack{t \in \{1, \dots, T\}: \\ x_{-t} < x_{-(t-1)}}} \delta^{t-1} (x_{-t} - x_{-(t-1)}). \quad (3)$$

As in Bossert and D'Ambrosio (2013), the class of measures identified in the above theorem can be narrowed down further by imposing a requirement that we refer to as loss priority: a ceteris-paribus loss in a given period has a greater impact on individual insecurity than a ceteris-paribus gain of the same magnitude in the same period. This axiom imposes further restrictions on the relationships between the parameters  $\ell_0$ ,  $g_0$  and  $\delta$ .

**Loss priority.** For all  $T \in \mathbb{N}$ , for all  $x \in \mathbb{R}^{(T-1)}$  and for all  $f \in \mathbb{R}_{++}$ ,

$$I^T(x_{-(T-1)} + f, x) - I^T(x_{-(T-1)}, x) > I^T(x_{-(T-1)}, x) - I^T(x_{-(T-1)} - f, x).$$

If loss priority is added to the axioms of Theorem 2, it follows immediately that  $\ell_0$  (the weight on aggregate discounted losses) must exceed  $g_0$  (that on aggregate discounted gains). This implies that

$$\frac{g_0}{\ell_0} < 1 < \frac{\ell_0}{g_0}$$

and the minimum of the two ratios is  $g_0/\ell_0$ . We thus have the following result.

**Theorem 3.** *A measure of individual economic insecurity  $I$  satisfies gain-loss monotonicity, proximity monotonicity, homogeneity, translation invariance, quasilinearity, stationarity, resource-variation monotonicity and loss priority if and only if there exist  $\ell_0, g_0 \in \mathbb{R}_{++}$  and  $\delta \in (0, g_0/\ell_0)$  such that  $\ell_0 > g_0$  and, for all  $T \in \mathbb{N}$  and for all  $x \in \mathbb{R}^{(T)}$ ,*

$$I^T(x) = \ell_0 \sum_{\substack{t \in \{1, \dots, T\}: \\ x_{-t} > x_{-(t-1)}}} \delta^{t-1} (x_{-t} - x_{-(t-1)}) + g_0 \sum_{\substack{t \in \{1, \dots, T\}: \\ x_{-t} < x_{-(t-1)}}} \delta^{t-1} (x_{-t} - x_{-(t-1)}).$$

We propose to use a member of the class identified in Theorem 3 to measure economic insecurity. The loss-priority property is akin to the loss-aversion assumption in decision theory, and would seem to adequately capture the attitude of households that are concerned with their ability to absorb adverse shocks.

The following example illustrates the class of measures characterized in Theorem 3.

**Example 1.** *Throughout the example, suppose that  $T = 3$  and the weights assigned to aggregate losses and gains are  $\ell_0 = 1$  and  $g_0 = 15/16$ .*

(a) *Consider the stream  $x^1 = (4, 12, 12, 16)$ . We obtain*

$$I^3(x^1) = g_0 (\delta^2(4 - 12) + \delta^0(12 - 16)) = -\frac{15}{2}\delta^2 - \frac{15}{4} < 0.$$

As resources never fall from one period to the next, the agent never experiences any losses and, as a result, the resulting insecurity value is negative for any choice of the discount factor  $\delta \in (0, 15/16)$ . In general, any stream without losses and at least one gain has a negative insecurity value and, thus, represents less insecurity than any constant resource stream.

(b) Now consider the reverse stream  $x^2 = (16, 12, 12, 4)$ . It follows that

$$I^3(x^2) = \ell_0 (\delta^2(16 - 12) + \delta^0(12 - 4)) = 4\delta^2 + 8 > 0.$$

The agent never experiences any gains and, thus, the resulting insecurity value is always positive. Clearly, any stream without gains and at least one loss is associated with a positive insecurity value and therefore is more insecure than any constant resource stream.

(c) Let  $x^3 = (16, 4, 4, 12) \in \mathbb{R}^{(3)}$ . In this stream, the individual experiences a loss of 12 when moving from three periods ago to two periods ago, no change in the period that follows and, finally, a gain of 8 in the move from the previous period to today. For any discount factor  $\delta \in (0, 15/16)$ , the corresponding value of the insecurity index is

$$I^3(x^3) = \ell_0 \delta^2(16 - 4) + g_0 \delta^0(4 - 12) = 12\delta^2 - 15/2.$$

For any value of  $\delta$  above  $(1/2)\sqrt{5/2}$ , the index value is positive (and, thus,  $x^3$  is associated with more insecurity than the insecurity of a constant stream); if  $\delta$  is less than  $(1/2)\sqrt{5/2}$ , insecurity is lower than that resulting from a constant resource stream.

(d) Finally, consider the stream  $x^4 = (4, 16, 16, 8)$ . It follows that

$$I^3(x^4) = g_0 \delta^2(4 - 16) + \ell_0 \delta^0(16 - 8) = -\frac{45}{4}\delta^2 + 8.$$

For any value of  $\delta$  below  $(4/3)\sqrt{2/5}$ , the index value is positive and  $x^4$  is associated with more insecurity than the insecurity of a constant stream.

In our empirical analysis we set  $\ell_0 = 1$ ,  $g_0 = 15/16$  and  $\delta = 0.9$ . We use the stream of annual household equivalized incomes over the previous five years as the empirical counterpart of  $x$  above. We have tested the sensitivity of our results to the choice of these different parameters: marginal changes in  $\ell_0, g_0, \delta$  and  $T$  do not affect our qualitative conclusions.

## 3 The Rise of the Right

### 3.1 A Long-run Panel Data Analysis

We now take our economic insecurity index, as developed above, and use to address a topical question in social science: the way in which individuals vote in general, and the recent success of more right-leaning political parties in a number of countries. The contribution of this section is to do so using data from two of the best-known long-run panel surveys, the British Household Panel Survey (BHPS) and the German Socio-Economic Panel (SOEP).

The BHPS is a general survey that includes a random sample initially covering approximately 10,000 individuals in 5,500 British households. Later waves of this survey included refresher samples that increased the number of individuals interviews towards 15,000 per year. The BHPS provides a wide range of information on individuals and household demographics, income, attitudes and political preferences. Our main variable of interest here is a measure of voting intentions, as measured by the following questions. BHPS respondents are first asked the following two questions: “Now I have a few questions about your views on politics. Generally speaking do you think of yourself as a supporter of any one political party?” and “Do you think of yourself as a little closer to one political party than to the others?” If the respondent replies “Yes” to either of these two questions, they are then asked which political party they support.

On the contrary, if respondents reply “No” to both questions, the interviewer asked: “If there were to be a general election tomorrow, which political party do you think you would be most likely to support?” Our measure of political preference is based on the combination of the answers to these three questions, and individuals are considered as having no political preferences if they reply “No” to the first two questions and “None” or “Don’t know” to the hypothetical-election question. We exclude individuals who answered “Can’t vote.” We then create a categorical political-preference variable, *Party*, with the following categories: “Conservative Party,” “Liberal Party,” “Labour Party,” “Other Parties” and “No Political Preferences.” The BHPS was launched in 1991 with annual surveys being carried out up to 2008. It was then incorporated into Understanding Society, but only starting with the second wave of interviews of the latter.

The SOEP is an ongoing panel survey with yearly re-interviews. The starting sample in 1984 contained close to 6,000 households based on a random multistage sampling design. A sample of about 2,200 East German households was added in June 1990, half a year after the fall of the Berlin wall, and since then new samples have been added either for particular population groups or as refresher samples. As in the BHPS, the SOEP contains information about individual and household demographics, attitudes and income. Political preferences come from the following set of questions: “Many people in Germany lean towards one party in the long term, even if they occasionally vote for another party. Do you lean towards a particular party?” If respondents answered “Yes,” they were then asked: “Toward which party do you lean?” Our political-preference variable in Germany has the following categories: “CDU/CSU,” “FDP,” “SPD,” “Other Parties” and “No Political Preferences.” Later in the paper, we will explicitly distinguish “The Greens” and “Die Linke” from the parties included in the category “Other Parties.”

Our estimation samples for both surveys will cover individuals aged between 18 and 65 who are not retired and with valid information on economic insecurity, household equivalized income and political preferences (we will consider older respondents as part of the robustness checks in Section ??). We do not use the first 1984 SOEP wave due to income-measurement errors. Household income is also only available from 1992 onwards in East Germany. We then have data from 1985 to 2016 in West Germany and from 1992 to 2016 in East Germany. This produces 67,844 observations in the BHPS and 209,600 in the SOEP. We provide descriptive statistics on these samples in Tables A1 and A2. The two samples are notably similar with respect to mean age (around 41), percentage female (just over 50), percentage married (two-thirds) and percentage employed (just over three-quarters); on the contrary, the share of individuals reporting “No party” in the UK is only just under half that in Germany. We might expect political preferences to be relatively stable over time at the individual level. Tables A3 and A4 present the transition matrices for political preferences between  $t$  and  $t + 1$ . In both countries, the diagonal is heavily-populated, reflecting the stability of individual political preferences over time.

Regarding our key explanatory variable in the political-preference regressions, Figure 6 depicts the evolution of mean economic insecurity in the UK (on the left) and Germany (on the right), where the 2000 value of the insecurity index in each country serves as base 100. These are plotted together with the national unemployment rates, revealing as expected a positive correlation between the two.



Figure 6: Economic insecurity and unemployment over time – BHPS and SOEP

The general models of economic insecurity and political preferences we estimate are given by

$$Support_{i,t+1} = \beta_1 HHincome_{i,t} + \beta_2 I_{i,t}^5 + \beta_3 X_{i,t} + \lambda_t + \epsilon_{i,t} \quad (4)$$

$$Party_{i,t+1} = \beta_1 HHincome_{i,t} + \beta_2 I_{i,t}^5 + \beta_3 X_{i,t} + \lambda_t + \epsilon_{i,t} \quad (5)$$

where  $Support_{i,t+1}$  is a dummy for individual  $i$  supporting a party and  $Party_{i,t+1}$  the party supported, both measured at time  $t + 1$ ,  $HHincome_{i,t}$  represents the equivalized annual household income of  $i$  at time  $t$ , and  $I_{i,t}^5$  is the value of economic insecurity of  $i$  at time  $t$ . Economic insecurity is calculated using information on household real equivalized income and, thus, the standard errors are clustered at the household level. We standardize both economic insecurity and equivalized household income in the regressions so that the estimated coefficients refer to a one-standard-deviation change. The variable  $\lambda_t$  controls for year fixed effects, while the vector  $X_{i,t}$  includes a set of individual covariates: age, gender, education, marital status, number of children, labor-force status, home-ownership and region fixed effects. Home-ownership here acts as a measure of wealth. Figure 6 suggests that we should also take into account a possible confounding influence of unemployment. To do so, the vector  $X_{i,t}$  includes dummies for past unemployment (over the past four years). As we require income information over a five-year period to calculate our insecurity at time  $t$  (which is then related to political preferences at time  $t + 1$ ), our first observation on the political dependent variable in the regressions applies to 1996 in the BHPS and to 1990 in the SOEP.

As noted above, the BHPS was incorporated into Understanding Society starting with the second wave of interviews of the latter in 2010. The BHPS respondents in Understanding Society thus have missing values for their equivalized household incomes in 2009, so that we could only extend our analysis (of political preferences in  $t$  to economic insecurity measured over the five-year window between  $t - 5$  and  $t - 1$ ) to Understanding Society starting in the 2015 wave. Our long-run analysis of UK political preferences in general will thus refer to the 18 waves of the BHPS (although we will use cross-section Understanding Society data below when we consider the Brexit vote).

Equation (4) is estimated using a logit model while, as in much of the economic voting literature, we estimate the equation (5) with a multinomial logit model. In the context of voting decisions, it can be argued that multinomial probit models are more appropriate. Dow and Endersby (2004) discuss the strengths and weaknesses of the multinomial logit and multinomial probit models in the economic voting literature. They conclude that while the multinomial probit model does not rely on the independence-of-irrelevant-alternatives assumption, its relatively difficult maximum-likelihood optimization procedure may fail to converge and produce imprecise estimates.

### 3.1.1 Empirical Results

Table 1 asks whether economic insecurity at time  $t$  predicts future support for any political party at time  $t + 1$ . We show the marginal effects for economic insecurity, income and homeownership (wealth) from equation (4). The resulting coefficients on economic insecurity are thus estimated holding both income flow and stock constant, so that we do not confound insecurity with low income. Economic insecurity is associated with significantly higher political support at the 1% level in both the BHPS and the SOEP: all else equal, a one-standard-deviation rise in economic insecurity at  $t$  increases the probability of supporting a party at  $t + 1$  by 0.8 percentage points in the UK and 1.0 percentage points in Germany, corresponding to a third of the size of the marginal effects of equivalized household income and of homeownership in both countries.

Table 2 considers which parties benefit from this greater political support. The estimates shown in the last column of both panels of this table, on the probability of not supporting a party, are of course the mirror images of those for any party support shown in Table 1. With respect to the actual parties supported, the results in Table 2 are similar for the BHPS and the SOEP: economic insecurity mainly benefits right-leaning parties (the Conservatives and the CDU/CSU) and, to a lesser extent, center parties

Table 1: Economic insecurity and probability of supporting a party: Logit results – BHPS and SOEP

	(1) BHPS	(2) SOEP
Economic Insecurity (std)	0.008*** (0.002)	0.010*** (0.002)
Log(Eq. HH Income) (std)	0.020*** (0.002)	0.032*** (0.004)
Homeowner (dummy)	0.026*** (0.005)	0.027*** (0.006)
<i>Observations</i>	67844	209600
<i>Log Likelihood</i>	-38318	-132736

Notes: The standard errors in parentheses are clustered at the household level. The figures are marginal effects. The control variables include age dummies, gender, education, marital status, the number of children, wave dummies, region dummies, labor-force status and dummies for unemployment over the past four years. \*, \*\*, \*\*\* stand for  $p < 0.1$ ,  $p < 0.05$  and  $p < 0.01$ .

(the Liberals/FDP). Rises in economic insecurity are not correlated with support for the SPD in Germany, for the Labour Party in the UK and for the other parties in both countries. In most cases, the size of the economic-insecurity effects on support for specific parties are qualitatively comparable to the estimated marginal effects from equivalized household income and home-ownership.

Economic insecurity therefore increases support at the right side of the political spectrum. Recent research in psychology and political science (see Jost *et al.*, 2003, Jost *et al.*, 2007, Inglehart and Norris, 2016, and Walley, 2017) has underlined that individuals who value security and stability are more likely to support conservative parties. The economic-insecurity index that we propose thus appears to at least partly capture these attributes using panel data on individuals’ past incomes, shifting political support towards the right as suggested.

To simplify the comparison with the BHPS results, we reduced the spectrum of German political parties in Table 2. In Table A5 we relax this simplification by separating “Alliance 90/The Greens” and “Die Linke” from the other-party category. We first present the full-sample results in Panel A. Then, as we may expect West and East Germans to react differently to economic insecurity, we analyze these two groups separately in Panels B and C. Economic insecurity never affects Green support in any panel. However, economic insecurity does reduce Die Linke support in Panel A, and with West Germans representing 75% of the total estimation sample, similarly so in Panel B. The results in East Germany are somewhat different, as economic insecurity still benefits right-leaning parties, but also to a lesser extent the SPD (although the marginal effect here is not significantly different from zero at conventional levels).

While Table A5 reports regional heterogeneity in Germany, Tables A6 and A7 consider the results by time period, pre-2000 versus post-2000, in the BHPS and SOEP respectively. The last column of each table indicates how economic insecurity at  $t$  affects the probability of supporting no party at  $t + 1$ . In both tables, this estimated coefficient is significantly negative only after 2000, with the difference from the pre-2000 effect being significant at least at the 5% level. In Table A6, economic insecurity increased support for the Conservative and Liberal Parties at the cost of the Labour Party in the earlier time period; post-2000 there was no longer a reduction in Labour-Party support. The pattern is similar in

Table 2: Political preferences and economic insecurity: Multinomial logit results (marginal effects)

	BHPS				
	Conserv.	Liberal	Labour	Other	No Pol. Pref.
Economic Insecurity (std)	0.011*** (0.002)	0.001 (0.001)	-0.002 (0.002)	-0.002 (0.001)	-0.008*** (0.002)
Log(Eq. HH Income) (std)	0.030*** (0.002)	-0.006*** (0.002)	0.001 (0.002)	-0.005*** (0.001)	-0.020*** (0.002)
Homeowner (dummy)	0.049*** (0.004)	0.018*** (0.003)	-0.043*** (0.006)	0.002 (0.003)	-0.026*** (0.005)
<i>Observations</i>	67844				
<i>Log Likelihood</i>	-89048				
	SOEP				
	CDU/CSU	FDP	SPD	Other	No Pol. Pref.
Economic Insecurity (std)	0.012*** (0.001)	0.002*** (0.000)	-0.002 (0.001)	-0.002* (0.001)	-0.010*** (0.002)
Log(Eq. HH Income) (std)	0.035*** (0.004)	0.007*** (0.001)	-0.002 (0.003)	-0.007*** (0.002)	-0.032*** (0.004)
Homeowner (dummy)	0.066*** (0.005)	0.002 (0.001)	-0.026*** (0.005)	-0.013*** (0.004)	-0.027*** (0.006)
<i>Observations</i>	209600				
<i>Log Likelihood</i>	-229884				

Notes: The standard errors in parentheses are clustered at the household level. The figures are marginal effects. The control variables include age dummies, gender, education, marital status, the number of children, wave dummies, region dummies, labor-force status and dummies for unemployment over the past four years. \*, \*\*, \*\*\* stand for  $p < 0.1$ ,  $p < 0.05$  and  $p < 0.01$ .

Germany: economic insecurity reduced the support for the SPD (although the coefficient is not significant at standard levels) before 2000 but not after 2000. Tables A6 and A7 also indicate that economic insecurity benefited right-leaning parties in both time periods, with some indication (at the 10% level) of a greater effect over the more recent periods in both countries.

Finally, Table A8 explores potential heterogeneity in the relationship between economic insecurity and political party support at  $t + 1$  by gender, marital status and parenthood (columns (1) to (6)). We do not distinguish between parties in a multinomial analysis here owing to space limitations, but note that right-leaning parties always benefit from economic insecurity. The requisite multinomial-logit results are available upon request. The relationship is slightly larger for women, but only significantly so in Germany. Economic insecurity has a greater effect for the married and parents in both countries (at the 1% level, except for parenthood in the SOEP), reflecting perhaps the greater vulnerability of those with a family. We also checked for a possible moderating effect of income, splitting the sample into those above and below median income, but found no significant differences. Analogously, there are no differences in the results for renters and homeowners.

### 3.1.2 Robustness Checks

Our main results relate political preferences at  $t + 1$  to economic insecurity at  $t$ . This relationship will not be causal if there is an omitted variable that simultaneously predicts current economic insecurity and future political preferences. To help control for this possibility, we estimate a value-added model controlling for political preferences at  $t - 1$ . The intuition is that any omitted variable that predicts both economic insecurity at  $t$  and political preferences at  $t + 1$  will be picked up by political preferences at  $t - 1$ . The equation estimated here is given by

$$Party_{i,t+1} = \alpha_1 HHincome_{i,t} + \alpha_2 I_{i,t}^5 + \alpha_3 Party_{i,t-1} + \alpha_4 X_{i,t} + \lambda_t + \epsilon_{i,t}. \quad (6)$$

The regression results appear in columns (1) and (2) of Table A9. Compared to our baseline results in Table 1, the marginal effects of economic insecurity (as well as those of household income and homeownership) fall by about a half, but are all still significantly different from zero.

Liberini, Redoano and Proto (2017) and Ward (2015) have recently shown that subjective well-being predicts voting behaviour. If insecurity affects satisfaction (as shown in Clark, 2018) and satisfaction affects voting, how much of our political-participation effect is mediated by life satisfaction? Columns (3) and (4) in Table A9 re-estimate our main regression controlling for life satisfaction (note that the BHPS sample size is smaller here because life satisfaction is only recorded in waves 6 to 10 and 12 to 18). This does not change the estimated coefficients, so that life satisfaction is not the main determinant of political preferences.

We can also ask whether the insecurity index we propose outperforms other measures such as the Hacker, Huber, Rehm, Schlesinger and Valletta (2010) of a sharp (over 25%) drop in available income over the past year, and the variance in household equivalized income over five years. Note that the former also includes lack of an adequate financial safety net but data constraints prevent us from including this dimension in the index. We apply the same approach as in Clark (2001), comparing the explanatory power of each economic-insecurity measure introduced in turn into a regression with the same sample and set of controls: the best model has the least-negative log-likelihood. The log-likelihood in Table 1 is -38318 (-132736) in the BHPS (SOEP) with our index. Columns (5) to (8) in Table A9 show the results for the other indices, all of which produce more negative log-likelihoods than those in Table 1: the economic insecurity index we propose thus fits the data best.

Columns (9) and (10) check the convergent validity of our results using a different dependent variable. Respondents in both the BHPS and the SOEP are asked about their interest in politics (on a four-point scale), and we now re-estimate equation (4) with the dependent variable being interest in politics at  $t + 1$ . Economic insecurity increases interest in politics in both samples (as do equivalized household income and home-ownership), similar to the results for political-party support in Table 1.

## 3.2 The Election of Donald Trump

Our results above refer to two European countries. We now turn to US data, and in particular to the results of the last Presidential election. To do so, we require data with both past equivalized household income and current political preferences. To the best of our knowledge, the only dataset with this information is the Understanding American Society (UAS, see <https://uasdata.usc.edu/index.php>) survey conducted by the University of Southern California. UAS is a panel of households with approximately 6,500 respondents, and is representative of the entire United States. The study is an Internet panel, where respondents answer the surveys online at a time of their choosing. From the beginning of the study on May 31st 2014 up until August 2018, the University of Southern California has carried out approximately 150 different UAS surveys on different topics such as politics, consumer behavior, financial literacy and health.

The topic that interests us here is political behavior. This is measured in the Election Poll Study component of UAS, where respondents were asked to report their probability (on a 0-100 scale) of voting in the Presidential election and their probability to vote for Donald Trump, Hillary Clinton or any of the other candidates. The Election Poll Study was run between July 4th 2016 and November 7th 2016. Respondents could fill out the questionnaire as many times as they wanted while the poll was open (respondents replied on average 11.3 times). Overall 4,295 UAS respondents participated in the election-poll study, of whom 2,358 are between 18 and 60 years old, not retired and have at least five records of household income before the start of the election-poll survey (on average, these respondents have 28.5 income records between their first wave and their first participation in the Election Poll Study). Income in the UAS is measured as an annual household figure in banded categories. We imputed the mean value of annual household income per income band using the data from the Current Population Survey. Between the first survey and the Trump election (around 30 months), 55 UAS surveys were conducted, so that we have at most 55 measures of imputed household income per individual. We only keep individuals with at least five records of household income to calculate our insecurity index.

Our first OLS regression is based on the equation

$$Probability_{i,t+1} = \beta_1 HHincome_{i,t} + \beta_2 I_{i,t}^5 + \beta_3 X_{i,t} + \lambda_t + \epsilon_{i,t} \quad (7)$$

where  $Probability_{t+1}$  refers successively to the probabilities of voting on election day, and voting for Trump, Clinton, or any of the other candidates. Although individuals can reply multiple times to the Election Poll Study, our main analysis refers only to the most recent observation per individual to proxy for their actual voting behavior on the day of the Presidential election. We can nevertheless reproduce our results using all the individual observations or the individual mean of political preferences. The periods  $t + 1$  and  $t$  refer to the ultimate and penultimate individual observations before the election.  $HHincome_{i,t}$  is the equivalized annual household income of  $i$  at time  $t$ , while the vector  $X_{i,t}$  includes a set of individual covariates similar to those in equations (4) and (5). We cannot control for homeownership as this information is missing in UAS. We again standardize both economic insecurity and equivalized household income in the regressions.

As in Section 3.1, we also estimate the following multinomial-logit regression

$$Support_{i,t+1} = \beta_1 HHincome_{i,t} + \beta_2 I_{i,t}^5 + \beta_3 X_{i,t} + \lambda_t + \epsilon_{i,t} \quad (8)$$

where  $Support_{t+1}$  is a categorical variable for the candidate the survey respondent supports the most. We cannot identify this variable for 118 cases as the respondents assigned either a probability of 50% to each of two candidates or 33% to each of three candidates. We assign individuals to a fourth “No Vote” category if they reported a probability to vote in the Presidential election of zero. The complete descriptive statistics for the estimation sample can be found in Table A10.

Table 3 shows the estimates on our economic insecurity and equivalized household income variables as predictors of voting in the 2016 US Presidential Election. The estimated coefficient in the first column is of the same size as in the BHPS and SOEP: a one standard-deviation rise in economic insecurity predicts an increase of 0.69 percentage points in the voting probability, although the estimate is not significant at conventional levels. In the next three columns individual economic insecurity predicts greater support for

Donald Trump and reduces support for Hillary Clinton (with no effect for the “Other Candidates”). The effect of insecurity is of the same nature as that of annual household income, where richer households are more likely to vote and to support Donald Trump. In an additional analysis, we weighted the candidates’ probabilities by the probability of voting (as analyzed in column 1); this produced coefficients that were very little changed, but more precisely estimated. Last, columns 5-8 depict the marginal effects from the multinomial logit analysis, which confirm that economic insecurity is associated with political support for the right.

Table 3: Voting behaviour and political preferences in UAS: OLS and multinomial logit results

	OLS - Probability to Vote:				Multinomial Logit: Voting Behaviour			
	Election (1)	Trump (2)	Clinton (3)	Other (4)	Trump (5)	Clinton (6)	Other (7)	No Vote (8)
Economic Insecurity (std)	0.694 (0.651)	1.877** (0.908)	-1.821** (0.894)	-0.056 (0.670)	0.025** (0.010)	-0.015 (0.010)	-0.004 (0.007)	-0.006 (0.005)
Log(Eq. HH Inc.) (std)	1.432* (0.738)	2.033** (1.030)	-0.966 (1.014)	-1.089 (0.760)	0.019* (0.011)	-0.005 (0.011)	-0.005 (0.007)	-0.009 (0.007)
Observations	2358	2358	2358	2358	2240	2240	2240	2240
Adjusted R <sup>2</sup>	0.090	0.115	0.121	0.045	.	.	.	.
Log Likelihood	.	.	.	.	.	-2326	.	.

Notes: The standard errors in parentheses are clustered at the household level. The figures are marginal effects. The control variables include age dummies, gender, education, marital status, the number of children, wave dummies, region dummies, labor-force status and dummies for past unemployment over 4 years. \*, \*\*, \*\*\* stand for  $p < 0.1$ ,  $p < 0.05$  and  $p < 0.01$ .

### 3.3 Support for Brexit

We now address the question of the relationship between the support for Brexit and economic insecurity. To do so, we use the UK Household Longitudinal Study (UKHLS), also known as Understanding Society, which started in 2009. UKHLS is the largest panel survey in the world devoted to social and economic research, covering around 100,000 individuals in 40,000 households in the United Kingdom. In Wave 8, UKHLS Respondents were asked the following question: “Should the United Kingdom remain a member of the European Union or leave the European Union?” Wave 8 of Understanding Society was conducted between 2017 and 2018, implying that this question was asked more than a year after the actual referendum date of June 23, 2016. Nevertheless, the wording of the question in Understanding Society is the same as that used in the actual referendum. As such, we consider the response to this question as a reliable proxy for the support for Brexit.<sup>1</sup> We estimate the following equation via logit:

$$Leave_{i,t+1} = \beta_1 HHincome_{i,t} + \beta_2 I_{i,t}^5 + \beta_3 X_{i,t} + \lambda_t + \epsilon_{i,t} \quad (9)$$

where  $Leave_{i,t+1}$  takes the value of one if respondent  $i$  stated that the United Kingdom should leave the European Union and zero if it should remain a member. The independent variables are the same as in Section 3.1 and the estimation sample has the same characteristics. Of the 13,381 individuals in the estimation sample, 41% replied “Leave the EU.” The complete descriptive statistics can be found in Table A12.

Table 4: Economic insecurity and probability of supporting Brexit: Logit results (Marginal Effects)

	Leave the EU
Economic Insecurity (std)	0.010** (0.005)
Log(Eq. HH Income) (std)	-0.066*** (0.006)
Homeowner (dummy)	-0.065*** (0.012)
Observations	13381
Log Likelihood	-8626

Notes: The standard errors in parentheses are clustered at the household level. The figures refer to marginal effects. The control variables include dummies for age, gender, education, marital status, number of children, wave, region, labour-force status and unemployment over the past 4 years. \*, \*\*, \*\*\* stand for  $p < 0.1$ ,  $p < 0.05$  and  $p < 0.01$ .

Table 4 shows the marginal effects for economic insecurity, equivalized household income and homeownership. The estimated effect of economic insecurity is in line with all of the results presented above: one standard deviation higher economic insecurity is associated with a one percentage point higher probability of reporting “Leave the EU.” The effects of household income and wealth (as proxied by

<sup>1</sup>Powdthavee, Plagnol, Frijters and Clark (2019) consider the relationship between the Brexit referendum outcome and subjective well-being, as a function of prior Brexit preferences in UKHLS data.

homeownership) are both significant and are of the opposite sign: individuals with more resources were more likely to prefer Remain.<sup>2</sup>

## 4 Concluding Remarks

Economic insecurity is clearly a widespread phenomenon, and we expect it to occupy an increasingly central role in the future. Individuals' economic security is of obvious importance for social cohesion, the understanding of changing inequality, and the perceived and actual effects of public-policy choices. At the same time of this growing interest in insecurity, there is no accepted standard measure. The first contribution of our work here was to propose an axiomatic individual-level of economic insecurity based on individual income streams (although the general principle can be applied to the stream of any kind of resource). We hope that the measure presented here (and any possible refinements that may be developed in future work) will be of use in future research in a wide variety of areas.

We then applied this theoretical index to data from long-running large-scale panel datasets in the UK and Germany in order to see how economic insecurity affects political preferences. The results in both countries are unambiguous: insecurity significantly increases political activism (in terms of the probability of supporting a political party), with this increased participation mainly benefiting parties on the Right (the Conservative Party in the UK and the CDU/CSU in Germany). Insecurity is not proxying for individual-level resources here as the its consistent significant effect is conditional on individual income, homeownership, current labour-force status and past unemployment. These results hold in both earlier and later time periods, are more pronounced for the married and those with children, and are not mediated by life satisfaction.

We also used data from an American survey to show that economic insecurity affected political preferences before the 2016 Presidential election: it significantly increases the probabilities of voting in the Presidential election and of voting for Donald Trump, but reduces that of voting for Hillary Clinton. Last, we use recent data from the UK to show that our measure of economic insecurity predicts stronger support for Brexit. As above, these specific political preferences are conditional on the individual's current level of economic resources.

We believe that these results are important. They first provide new evidence on political outcomes, showing that economic insecurity encourages political activism, but of a certain kind: support for the Right. Our work here has used a fairly broad measure of political preferences, by considering the political party (or position) supported. Considering the relationship between economic insecurity and more specific economic and political attitudes would seem to be a promising research area.

More generally, we have shown that the theoretical work on socio-economic index numbers can successfully be complemented by empirical research on large-scale panel datasets. This allows us to test the index's predictions and to compare the empirical performance of different indices. In this latter respect, we found that our index of economic insecurity predicts future political preferences better than a number of existing measures. Applying this same test to other indices and more general individual outcomes constitutes a useful project for the evaluation of the salience of different indices on insecurity.

Insecurity then seems to provoke Conservative responses. Our main finding is of the same nature as much of the research on terrorism and voting, which has mostly concluded that the former increases Right-leaning support; see, for instance, Berrebi and Klor (2006), Akay, Bargain and Elsayed (2018) and Bonanno and Jost (2006). Montalvo (2011) is an exception here, suggesting that the switch to Left-leaning parties following the Madrid train bombings in 2004 was instead an indictment of the ruling (Conservative) party's handling of the event. While terrorism thankfully remains relatively rare, our

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<sup>2</sup>Liberini, Oswald, Proto and Redoano (2019) estimate the probability of supporting Brexit in Wave 8 UKHLS data, with interviews from January 2016 to December 2016. Their key explanatory variable of Brexit preferences is the response to the question "How well would you say you yourself are managing financially these days?". They show that, conditional on income, more negative responses to this question predict Brexit support. It would be of interest to correlate such subjective financial evaluations with our insecurity index set out above.

results here show that the widespread phenomenon of individual economic insecurity is also associated with shifting political preferences towards the Right.

## Appendix A: Proofs

**Proof of Theorem 1.** ‘If.’ That gain-loss monotonicity is satisfied follows because the functions  $\ell$  and  $g$  are positive-valued. Proximity monotonicity is satisfied because  $\ell$  and  $g$  are decreasing. Furthermore, it is immediate that homogeneity and translation invariance are satisfied. Finally, to see that quasilinearity is satisfied, define the function  $F^T : \mathbb{R} \rightarrow \mathbb{R}$  by letting

$$F^T(y) = \begin{cases} \ell(T)y & \text{if } y \geq 0 \\ g(T)y & \text{if } y < 0 \end{cases} \quad (10)$$

for all  $y \in \mathbb{R}$ .

‘Only if.’ Suppose that  $I$  satisfies the axioms of the theorem statement. We prove the requisite implication by inductively constructing the functions  $\ell$  and  $g$ .

**Step 1.** Let  $T = 1$  and  $x = (x_{-1}, x_0) \in \mathbb{R}^{(T)}$ .

**Case (1.i).** If  $x_{-1} = x_0$ , the application of translation invariance with  $c = -x_0$  yields

$$I^1(x_{-1}, x_0) = I^1(x_0, x_0) = I^1(x_0 - x_0, x_0 - x_0) = I^1(0, 0).$$

Homogeneity implies that  $I^1(b \cdot 0, b \cdot 0) = bI^1(0, 0)$  for all  $b \in \mathbb{R}_{++}$  and, thus, it follows that  $I^1(x_{-1}, x_0) = 0$  whenever  $x_{-1} = x_0$ .

**Case (1.ii).** If  $x_{-1} > x_0$ , translation invariance with  $c = -x_0$  implies

$$I^1(x_{-1}, x_0) = I^1(x_{-1} - x_0, 0).$$

Using homogeneity with  $b = x_{-1} - x_0 > 0$ , it follows that

$$\begin{aligned} I^1(x_{-1}, x_0) &= I^1(x_{-1} - x_0, 0) = I^1((x_{-1} - x_0) \cdot 1, (x_{-1} - x_0) \cdot 0) \\ &= (x_{-1} - x_0)I^1(1, 0) = \ell(1)(x_{-1} - x_0), \end{aligned}$$

where  $\ell(1) = I^1(1, 0)$ . It follows from gain-loss monotonicity that  $\ell(1) > 0$ .

**Case (1.iii).** If  $x_{-1} < x_0$ , translation invariance with  $c = -x_0$  implies

$$I^1(x_{-1}, x_0) = I^1(x_{-1} - x_0, 0)$$

and, using homogeneity with  $b = -(x_{-1} - x_0) > 0$ , we obtain

$$\begin{aligned} I^1(x_{-1}, x_0) &= I^1(x_{-1} - x_0, 0) = I^1(-(x_{-1} - x_0) \cdot (-1), -(x_{-1} - x_0) \cdot 0) \\ &= -(x_{-1} - x_0)I^1(-1, 0) = -g(1)(x_{-1} - x_0), \end{aligned}$$

where  $g(1) = I^1(-1, 0)$ . That  $g(1) > 0$  follows again from gain-loss monotonicity.

Combining these three cases, it is immediate that (2) applies for  $T = 1$ . Note that only gain-loss monotonicity, homogeneity and translation invariance are required in this step of the proof.

**Step 2.** Now suppose that  $T \geq 2$  and, for all  $x \in \mathbb{R}^{(T-1)}$ ,

$$I^{T-1}(x) = \sum_{\substack{t \in \{1, \dots, T-1\}: \\ x_{-t} > x_{-(t-1)}}} \ell(t)(x_{-t} - x_{-(t-1)}) + \sum_{\substack{t \in \{1, \dots, T-1\}: \\ x_{-t} < x_{-(t-1)}}} g(t)(x_{-t} - x_{-(t-1)}) \quad (11)$$

where  $\ell(1) > \dots > \ell(T-1) > 0$  and  $g(1) > \dots > g(T-1) > 0$ . The conjunction of quasilinearity and (11) implies that there exists a function  $F^T: \mathbb{R} \rightarrow \mathbb{R}$  such that, for all  $x \in \mathbb{R}^{(T)}$ ,

$$\begin{aligned} I^T(x) &= I^{T-1}(x_{-(T-1)}, \dots, x_0) + F^T(x_{-T} - x_{-(T-1)}) \\ &= \sum_{\substack{t \in \{1, \dots, T-1\}: \\ x_{-t} > x_{-(t-1)}}} \ell(t) (x_{-t} - x_{-(t-1)}) + \sum_{\substack{t \in \{1, \dots, T-1\}: \\ x_{-t} < x_{-(t-1)}}} g(t) (x_{-t} - x_{-(t-1)}) + F^T(x_{-T} - x_{-(T-1)}). \end{aligned}$$

Homogeneity implies that  $F^T(b(x_{-T} - x_{-(T-1)})) = bF^T(x_{-T} - x_{-(T-1)})$  for all  $b \in \mathbb{R}_{++}$ . As in Step 1, we distinguish three cases.

**Case (2.i).** If  $x_{-T} = x_{-(T-1)}$ , homogeneity implies  $F^T(b \cdot 0) = bF^T(0)$  for all  $b \in \mathbb{R}_{++}$  and hence  $F^T(0) = 0$ .

**Case (2.ii).** If  $x_{-T} > x_{-(T-1)}$ , homogeneity with  $b = x_{-T} - x_{-(T-1)} > 0$  implies

$$F^T(x_{-T} - x_{-(T-1)}) = F^T((x_{-T} - x_{-(T-1)}) \cdot 1) = (x_{-T} - x_{-(T-1)})F^T(1) = \ell(T)(x_{-T} - x_{-(T-1)})$$

where  $\ell(T) = F^T(1)$ . Gain-loss monotonicity and proximity monotonicity together imply that  $0 < \ell(T) < \ell(T-1)$  so that the induced function  $\ell$  is positive-valued and decreasing.

**Case (2.iii).** If  $x_{-T} < x_{-(T-1)}$ , homogeneity with  $b = -(x_{-T} - x_{-(T-1)}) > 0$  implies

$$\begin{aligned} F^T(x_{-T} - x_{-(T-1)}) &= F^T(-(x_{-T} - x_{-(T-1)}) \cdot (-1)) = -(x_{-T} - x_{-(T-1)})F^T(-1) \\ &= g(T)(x_{-T} - x_{-(T-1)}) \end{aligned}$$

where  $g(T) = -F^T(-1)$ . Gain-loss monotonicity and proximity monotonicity together imply that  $0 < g(T) < g(T-1)$  and, thus,  $g$  is positive-valued and decreasing.

Thus, combining the observations of cases (2.i) to (2.iii), it follows that (10) is satisfied. Substituting back into (11), we obtain

$$\begin{aligned} I^{T-1}(x) &= \sum_{\substack{t \in \{1, \dots, T-1\}: \\ x_{-t} > x_{-(t-1)}}} \ell(t) (x_{-t} - x_{-(t-1)}) + \sum_{\substack{t \in \{1, \dots, T-1\}: \\ x_{-t} < x_{-(t-1)}}} g(t) (x_{-t} - x_{-(t-1)}) \\ &+ \begin{cases} \ell(T) (x_{-T} - x_{-(T-1)}) & \text{if } x_{-T} - x_{-(T-1)} \geq 0 \\ g(T) (x_{-T} - x_{-(T-1)}) & \text{if } x_{-T} - x_{-(T-1)} < 0 \end{cases} \\ &= \sum_{\substack{t \in \{1, \dots, T\}: \\ x_{-t} > x_{-(t-1)}}} \ell(t) (x_{-t} - x_{-(t-1)}) + \sum_{\substack{t \in \{1, \dots, T\}: \\ x_{-t} < x_{-(t-1)}}} g(t) (x_{-t} - x_{-(t-1)}) \end{aligned}$$

which completes the proof. ■

**Proof of Theorem 2.** ‘If.’ That gain-loss monotonicity, proximity monotonicity, homogeneity, translation invariance and quasilinearity are satisfied follows from Theorem 1.

To see that stationarity is satisfied, let  $G^r(y) = \delta^r y$  for all  $r \in \mathbb{N}_0$  and for all  $y \in \mathbb{R}$  in the definition of the axiom.

Finally, we prove that resource-variation monotonicity is satisfied. Let  $p \in \mathbb{R}$  and  $q \in \mathbb{R}_{++}$ . Substituting (3) in (1) yields

$$q [\ell_0 \delta^{t-1} - g_0 \delta^t] > q [\ell_0 \delta^t - g_0 \delta^{t+1}] > 0 > q [\ell_0 \delta^{t+1} - g_0 \delta^t] > q [\ell_0 \delta^t - g_0 \delta^{t-1}]$$

which is equivalent to

$$\delta^{t-1} [\ell_0 - g_0 \delta] > \delta^t [\ell_0 - g_0 \delta] > 0 > \delta^t [\ell_0 \delta - g_0] > \delta^{t-1} [\ell_0 \delta - g_0]. \quad (12)$$

These inequalities are satisfied because  $\delta \in (0, \min\{\ell_0/g_0, g_0/\ell_0\})$ .

‘Only if.’ Suppose that  $I$  satisfies the required axioms. By Theorem 1, there exist decreasing functions  $\ell: \mathbb{N} \rightarrow \mathbb{R}_{++}$  and  $g: \mathbb{N} \rightarrow \mathbb{R}_{++}$  such that (2) is satisfied. It remains to be shown that there exist  $\ell_0, g_0 \in \mathbb{R}_{++}$  and  $\delta \in (0, \min\{\ell_0/g_0, g_0/\ell_0\})$  such that  $\ell(t) = \ell_0 \delta^{t-1}$  and  $g(t) = g_0 \delta^{t-1}$  for all  $t \in \mathbb{N}$ .

First, we identify the class of parameter functions  $\ell$  that apply to the losses experienced in each period. This part of the proof parallels that of Theorem 4 in Blackorby, Bossert and Donaldson (1997). Let  $p, q \in \mathbb{R}_+$  be such that  $p \geq q$  and let  $s = 0$ . Substituting (2) in the definition of stationarity, we obtain

$$\ell(t+r+1)q + \ell(t+r+2)(p-q) = G^r(\ell(t+1)q + \ell(t+2)(p-q))$$

for all  $t, r \in \mathbb{N}_0$  or, setting  $u^0 = q$  and  $u^1 = p - q$ ,

$$\ell(t+r+1)u^0 + \ell(t+r+2)u^1 = G^r(\ell(t+1)u^0 + \ell(t+2)u^1) \quad (13)$$

for all  $t, r \in \mathbb{N}_0$  and for all  $u^0, u^1 \in \mathbb{R}_+$ .

Now define  $y = \ell(t+1)u^0$ ,  $z = \ell(t+2)u^1$ ,  $\bar{\ell}(t+r, y) = \ell(t+r+1)u^0$  and  $\widehat{\ell}(t+r, z) = \ell(t+r+2)u^1$ . Substituting, (13) implies

$$\bar{\ell}(t+r, y) + \widehat{\ell}(t+r, z) = G^r(y+z)$$

for all  $t, r \in \mathbb{N}_0$  and for all  $y, z \in \mathbb{R}_+$ . This is a Pexider equation defined on the domain  $\mathbb{R}_+$  and, by definition, the possible values of the functions  $\bar{\ell}$  and  $\widehat{\ell}$  (and, thus, the possible values of  $G^r$ ) are bounded below by zero. Therefore, the solutions of this functional equation are such that there exist functions  $d: \mathbb{N}_0 \rightarrow \mathbb{R}_+$  and  $e: \mathbb{N}_0 \rightarrow \mathbb{R}_+$  such that

$$\bar{\ell}(t+r, y) = d(r)y + e(r)$$

for all  $t, r \in \mathbb{N}_0$  and for all  $y \in \mathbb{R}_+$ ; see, for instance, Aczél (1966, p. 46 and p. 142). Also, note that  $d$  and  $e$  cannot depend on  $t$  because  $G^r$  does not. Using the definition of  $\bar{\ell}$ , it follows that

$$\ell(t+r+1)u = d(r)\ell(t+1)u + e(r) \quad (14)$$

for all  $t, r \in \mathbb{N}_0$  and for all  $u \in \mathbb{R}_+$ . Setting  $t = 0$  in (14), it follows that

$$\ell(r+1)u = d(r)\ell(1)u + e(r) \quad (15)$$

and, therefore,

$$\ell(t+r+1)u = d(t+r)\ell(1)u + e(t+r) \quad (16)$$

for all  $t, r \in \mathbb{N}_0$  and for all  $u \in \mathbb{R}_+$ . Setting  $r = 0$  in (15), we obtain

$$\ell(1)u = d(0)\ell(1)u + e(0)$$

for all  $u \in \mathbb{R}_+$ . Setting  $u = 0$ , it follows that  $e(0) = 0$ . Once this is established, we can choose any  $u > 0$  to conclude that  $d(0) = 1$ . Substituting (15) in (14), it follows that

$$\ell(t+r+1)u = d(r)[d(t)\ell(1)u + e(t)] + e(r)$$

and, together with (16),

$$d(t+r)\ell(1)u + e(t+r) = d(r)[d(t)\ell(1)u + e(t)] + e(r)$$

for all  $t, r \in \mathbb{N}_0$  and for all  $u \in \mathbb{R}_+$ . This is equivalent to

$$\ell(1)u[d(t+r) - d(t)d(r)] = d(r)e(t) + e(r) - e(t+r)$$

for all  $t, r \in \mathbb{N}_0$  and for all  $u \in \mathbb{R}_+$ . Because  $\ell(1)$  is positive and the right side of this equation does not depend on  $u$ , both sides must be identical to zero and, therefore, it follows that

$$d(t+r) = d(t)d(r) \quad (17)$$

for all  $t, r \in \mathbb{N}_0$ . Setting  $\delta = d(1)$ , a simple induction argument together with (17) establishes that  $d(t) = \delta^t$  for all  $t \in \mathbb{N}$ . Setting  $u = 0$  in (15), it follows that  $e(t) = 0$  for all  $t \in \mathbb{N}_0$ . Using this observation together with  $d(t) = \delta^t$  in (15), we obtain

$$\ell(t+1)u = \delta^t \ell(1)u$$

and, choosing any  $u > 0$ , it follows that  $\ell(t+1) = \ell(1)\delta^t$  for all  $t \in \mathbb{N}_0$  or, equivalently,

$$\ell(t) = \ell_0 \delta^{t-1} \quad (18)$$

for all  $t \in \mathbb{N}$ , where  $\ell_0 = \ell(1) > 0$ . Because  $\ell$  is positive-valued, it follows that  $\delta > 0$  and because  $\ell$  is decreasing, it follows that  $\delta < 1$  hence  $\delta \in (0, 1)$ .

To obtain the class of parameter functions  $g$  that apply to the gains experienced in each period, we can reproduce the above argument with the hypothesis that  $p, q \in \mathbb{R}_-$  are such that  $p \leq q$  (instead of the hypothesis that  $p, q \in \mathbb{R}_+$  are such that  $p \geq q$ ) to obtain the existence of  $g_0 \in \mathbb{R}_{++}$  and  $\sigma \in (0, 1)$  such that

$$g(t) = g_0 \sigma^{t-1} \quad (19)$$

for all  $t \in \mathbb{N}$ .

It remains to be shown that  $\delta = \sigma$  and that  $\delta \in (0, \min\{\ell_0/g_0, g_0/\ell_0\})$ . To accomplish this, we employ resource-variation monotonicity. Using (18) and (19) in (1), it follows that the expression

$$\ell(t) - g(t+1) = \ell_0 \delta^{t-1} - g_0 \sigma^t$$

is decreasing in  $t$ . Treating  $t$  as a continuous variable for convenience (which clearly does not involve any loss of generality), we can differentiate to obtain the condition

$$\ell_0 \delta^{t-1} \ln(\delta) - g_0 \sigma^t \ln(\sigma) < 0$$

for all  $t \in \mathbb{N}$ . Rearranging, we obtain

$$\frac{\delta^{t-1}}{\sigma^t} > \frac{g_0 \ln(\sigma)}{\ell_0 \ln(\delta)} > 0 \quad (20)$$

for all  $t \in \mathbb{N}$ , where these inequalities follow because both  $\delta$  and  $\sigma$  are in the open interval  $(0, 1)$ . Likewise, resource-variation monotonicity implies that

$$\ell(t+1) - g(t) = \ell_0 \delta^t - g_0 \sigma^{t-1}$$

is increasing in  $t$ . Differentiating again, it follows that

$$\ell_0 \delta^t \ln(\delta) - g_0 \sigma^{t-1} \ln(\sigma) > 0$$

for all  $t \in \mathbb{N}$ , which implies that

$$\frac{\delta^t}{\sigma^{t-1}} < \frac{g_0 \ln(\sigma)}{\ell_0 \ln(\delta)} < \infty \quad (21)$$

for all  $t \in \mathbb{N}$ .

If  $\delta < \sigma$ , we obtain

$$\lim_{t \rightarrow \infty} \frac{\delta^{t-1}}{\sigma^t} = \lim_{t \rightarrow \infty} \frac{1}{\sigma} \left( \frac{\delta}{\sigma} \right)^{t-1} = 0,$$

contradicting (20) which requires that this ratio be bounded below by the positive number

$$\frac{g_0 \ln(\sigma)}{\ell_0 \ln(\delta)}.$$

If  $\delta > \sigma$ , it follows that

$$\lim_{t \rightarrow \infty} \frac{\delta^t}{\sigma^{t-1}} = \lim_{t \rightarrow \infty} \delta \left( \frac{\delta}{\sigma} \right)^{t-1} = \infty,$$

contradicting (21) which demands that this ratio be bounded above by the finite number

$$\frac{g_0 \ln(\sigma)}{\ell_0 \ln(\delta)}.$$

Finally, note that (12)—and, thus, (1)—is satisfied only if  $\delta \in (0, \min\{\ell_0/g_0, g_0/\ell_0\})$ . ■

**Proof of Theorem 3.** Follows immediately from Theorem 2 and the definition of the loss-priority property. ■

## Appendix B: Additional Tables

Table A1: Descriptive statistics – BHPS

	Mean	SD	Min	Max
<i>Political Preferences:</i>				
Conservatives [R]	0.185	0.388	0	1
Labour [L]	0.112	0.315	0	1
Liberal [L]	0.334	0.472	0	1
Other Party	0.103	0.304	0	1
No Pol. Pref.	0.266	0.442	0	1
<i>Sociodemographic Variables:</i>				
Equivalized HH Income (log)	10.253	0.679	2.721	12.904
Economic Insecurity	-1968.28	5439.45	-14997.38	14999.84
Hacker's Insecurity Index	0.131	0.332	0	1
Variance in Eq. HH income (/1000)	318,442	1,146,625	5.121	9,971,874
Homeowner	0.782	0.413	0	1
Age	41.292	11.457	19	65
Female	0.541	0.498	0	1
Married	0.642	0.484	0	1
Separated	0.022	0.147	0	1
Divorced	0.095	0.293	0	1
Widowed	0.015	0.121	0	1
Never Married	0.243	0.429	0	1
No. Children	0.760	1.039	0	8
Employed	0.789	0.408	0	1
Unemployed	0.032	0.176	0	1
Out of the Labour Force	0.179	0.383	0	1
Observations	67844			

Notes: [R] and [L] respectively indicate whether the party is right-leaning or left-leaning based on the average position of the party in terms of its overall ideological stance and the classification in Hix and Lord (1997). (Source: 1999-2014 Chapel Hill Expert Survey.)

Table A2: Descriptive statistics – SOEP

	Mean	SD	Min	Max
<i>Political Preferences:</i>				
CDU/CSU [R]	0.143	0.360	0	1
FDP [R]	0.016	0.127	0	1
SPD [L]	0.169	0.370	0	1
The Greens [L]	0.049	0.216	0	1
Die Linke [L]	0.021	0.142	0	1
Other Party	0.015	0.123	0	1
No Party	0.574	0.493	0	1
<i>Sociodemographic Variables:</i>				
Equivalized HH Income (log)	10.357	0.575	0.693	12.939
Economic Insecurity	1,721.3	6,208.7	-29,978.7	29,979.4
Hacker's Insecurity Index	0.088	0.282	0	1
Variance in Eq. HH income (/1000)	318,554.8	1,786,235	0	9,999,947
Homeowner	0.494	0.500	0	1
Age	42.2	11.7	20	65
Female	0.519	0.500	0	1
Married	0.676	0.468	0	1
Separated	0.021	0.144	0	1
Divorced	0.075	0.263	0	1
Widowed	0.012	0.109	0	1
Never Married	0.216	0.412	0	1
Number of Children in HH	0.726	0.996	0	10
Employed	0.767	0.423	0	1
Unemployed	0.065	0.247	0	1
Out of the Labour Force	0.168	0.374	0	1
Observations	209600			

Notes: [R] and [L] respectively indicate whether the party is right-leaning or left-leaning based on the average position of the party in terms of its overall ideological stance and the classification in Hix and Lord (1997). (Source: 1999-2014 Chapel Hill Expert Survey.)

Table A3: Transition matrix – BHPS

	Party supported in t+1					Total	
	Conservatives [R]	Liberal/SPD [L]	Labour [L]	Other Party	No Pol. Pref.		
Party supported at t	Conservatives [R]	<b>9969</b> <b>(79.50)</b>	337 (2.69)	530 (4.23)	195 (1.56)	1509 (12.03)	12540
	Liberal/SPD [L]	433 (5.70)	<b>4869</b> <b>(64.07)</b>	830 (10.92)	278 (3.66)	1189 (15.65)	7599
	Labour [L]	569 (2.51)	862 (3.81)	<b>17739</b> <b>(78.33)</b>	488 (2.15)	2988 (13.19)	22646
	Other Party	187 (2.67)	211 (3.01)	400 (5.70)	<b>5131</b> <b>(73.17)</b>	1083 (15.44)	7012
	No Pol. Pref.	1,489 (8.25)	969 (5.37)	2119 (17.74)	1103 (6.11)	<b>12367</b> <b>(68.53)</b>	18047
	Total	12647	7248	21618	7195	19136	67844

Notes: The parentheses contain the row percentages. [R] and [L] respectively indicate whether the party is right-leaning or left-leaning based on the average position of the party in terms of its overall ideological stance and the classification in Hix and Lord (1997). (Source: 1999-2014 Chapel Hill Expert Survey.)

Table A4: Transition matrix – SOEP

	Party supported at t+1						
	CDU/ CSU [R]	FDP [R]	SPD [L]	The Greens [L]	Die Linke [L]	Other Party	No Pol. Pref.
Party supported at t							Total
CDU/ CSU [R]	<b>24534</b> ( <b>75.75</b> )	351 (1.08)	473 (1.46)	119 (0.37)	46 (0.14)	262 (0.81)	6,602 (20.38)
FDP [R]	453 (13.36)	<b>1937</b> ( <b>56.38</b> )	86 (2.54)	32 (0.94)	13 (0.38)	38 (1.12)	842 (24.83)
SPD [L]	554 (1.58)	112 (0.32)	<b>24974</b> ( <b>71.16</b> )	852 (2.43)	223 (0.64)	314 (0.89)	8067 (22.99)
The Greens [L]	103 (0.95)	113 (1.05)	729 (6.75)	<b>7,570</b> ( <b>70.09</b> )	124 (1.15)	217 (2.01)	1944 (18.00)
Die Linke [L]	37 (0.79)	15 (0.32)	230 (4.92)	209 (4.47)	<b>2933</b> ( <b>62.75</b> )	97 (2.08)	1153 (24.67)
Other Party	0 (0.00)	0 (0.00)	0 (0.00)	206 (11.05)	105 (5.63)	<b>1553</b> ( <b>83.32</b> )	0 (0.00)
No Pol. Pref.	6631 (5.46)	733 (0.60)	7414 (6.11)	1984 (1.63)	1121 (0.92)	1314 (1.08)	<b>102191</b> ( <b>84.19</b> )
Total	32312	3251	33906	10972	4565	3795	120799
							209600

Notes: The parentheses contain the row percentages. [R] and [L] respectively indicate whether the party is right-leaning or left-leaning based on the average position of the party in terms of its overall ideological stance and the classification in Hix and Lord (1997). (Source: 1999-2014 Chapel Hill Expert Survey.)

Table A5: Economic insecurity and voting behaviour: Multinomial results – West and East Germany

	SOEP						
	CDU CSU	FDP	SPD	The Greens	Die Linke	Other Party	No Pol. Pref.
<b>Panel A: Whole Sample</b>							
Econ. Insec. (std)	0.012*** (0.001)	0.002*** (0.000)	-0.002 (0.001)	-0.000 (0.001)	-0.003*** (0.000)	-0.000 (0.000)	-0.010*** (0.002)
Log(Eq. HH Inc.) (std)	0.035*** (0.004)	0.007*** (0.001)	-0.002 (0.003)	-0.001 (0.002)	-0.004*** (0.001)	-0.001** (0.001)	-0.032*** (0.004)
Homeowner (dummy)	0.066*** (0.005)	0.002 (0.001)	-0.026*** (0.005)	-0.003 (0.003)	-0.010*** (0.002)	-0.001 (0.001)	-0.027*** (0.006)
<i>Observations</i>				209600			
<i>Log Likelihood</i>				-229884			
<b>Panel B: West Germany</b>							
Econ. Insec. (std)	0.013*** (0.002)	0.002*** (0.000)	-0.004** (0.002)	-0.001 (0.001)	-0.001*** (0.000)	-0.001 (0.000)	-0.008*** (0.002)
Log(Eq. HH Inc.) (std)	0.039*** (0.004)	0.008*** (0.001)	-0.006* (0.004)	-0.002 (0.002)	-0.002*** (0.000)	-0.002*** (0.001)	-0.034*** (0.004)
Homeowner (dummy)	0.068*** (0.006)	0.003* (0.002)	-0.025*** (0.007)	-0.002 (0.003)	-0.005*** (0.001)	-0.001 (0.001)	-0.038*** (0.007)
<i>Observations</i>				162575			
<i>Log Likelihood</i>				-193062			
<b>Panel C: East Germany</b>							
Econ. Insec. (std)	0.015*** (0.003)	0.001 (0.001)	0.002 (0.002)	0.001 (0.001)	-0.003 (0.002)	0.002** (0.001)	-0.019*** (0.004)
Log(Eq. HH Inc.) (std)	0.026*** (0.007)	0.005** (0.002)	0.012** (0.005)	-0.000 (0.003)	-0.009** (0.004)	0.001 (0.002)	-0.035*** (0.008)
Homeowner (dummy)	0.049*** (0.010)	-0.002 (0.003)	-0.014** (0.007)	-0.007 (0.004)	-0.028*** (0.008)	-0.002 (0.003)	0.004 (0.013)
<i>Observations</i>				47025			
<i>Log Likelihood</i>				-50437			

Notes: The standard errors in parentheses are clustered at the household level. The figures are marginal effects. The control variables include age dummies, gender, education, marital status, the number of children, wave dummies, region dummies, labour-force status and dummies for past unemployment over 4 years. \*, \*\*, \*\*\* stand for  $p < 0.1$ ,  $p < 0.05$  and  $p < 0.01$ .

Table A6: Political preferences and economic insecurity in BHPS – multinomial logit results (marginal effects) before and after 2000

	Conserv.	Liberal	Labour	Other	No Pol. Pref.
<b>Panel A: Before 2000</b>					
Economic Insecurity (std)	0.006 (0.004)	0.003 (0.003)	-0.007 (0.005)	-0.002 (0.002)	0.000 (0.004)
Log(Eq. HH Income) (std)	0.037*** (0.005)	-0.006** (0.003)	-0.008* (0.004)	-0.006*** (0.001)	-0.017*** (0.004)
Homeowner (dummy)	0.043*** (0.009)	0.012* (0.007)	-0.025** (0.012)	-0.003 (0.005)	-0.026*** (0.010)
<i>Observations</i>			19660		
<i>Log Likelihood</i>			-25993		
<b>Panel B: After 2000</b>					
Economic Insecurity (std)	0.012*** (0.002)	0.001 (0.002)	-0.000 (0.002)	-0.002 (0.002)	-0.011*** (0.002)
Log(Eq. HH Income) (std)	0.028*** (0.003)	-0.004** (0.002)	0.004 (0.003)	-0.005** (0.002)	-0.023*** (0.003)
Homeowner (dummy)	0.052*** (0.005)	0.018*** (0.004)	-0.052*** (0.006)	0.004 (0.004)	-0.022*** (0.006)
<i>Observations</i>			47884		
<i>Log Likelihood</i>			-62911		

Notes: The standard errors in parentheses are clustered at the household level. The figures are marginal effects. The control variables include age dummies, gender, education, marital status, the number of children, wave dummies, region dummies, labour-force status and dummies for past unemployment over 4 years. \*, \*\*, \*\*\* stand for  $p < 0.1$ ,  $p < 0.05$  and  $p < 0.01$ .

Table A7: Political preferences and economic insecurity in SOEP – multinomial logit results (marginal effects) before and after 2000

	CDU CSU	FDP	SPD	The Greens	Die Linke	Other Party	No Pol. Pref.
<b>Panel A: Before 2000</b>							
Econ. Insec. (std)	0.009*** (0.003)	0.002** (0.001)	-0.005* (0.003)	0.000 (0.001)	-0.002** (0.001)	0.001 (0.001)	-0.004 (0.004)
Log(Eq. HH Inc.) (std)	0.029*** (0.006)	0.006*** (0.002)	-0.014*** (0.005)	-0.002 (0.002)	-0.003*** (0.001)	-0.001* (0.001)	-0.015** (0.006)
Homeowner (dummy)	0.090*** (0.008)	0.005*** (0.002)	-0.028*** (0.009)	0.001 (0.003)	-0.006*** (0.002)	0.000 (0.001)	-0.062*** (0.009)
<i>Observations</i>				72732			
<i>Log Likelihood</i>				-82142			
<b>Panel B: After 2000</b>							
Econ. Insec. (std)	0.014*** (0.002)	0.002*** (0.000)	-0.002 (0.001)	-0.001 (0.001)	-0.001* (0.001)	-0.000 (0.001)	-0.012*** (0.002)
Log(Eq. HH Inc.) (std)	0.040*** (0.004)	0.009*** (0.001)	0.003 (0.003)	-0.002 (0.002)	-0.005*** (0.000)	-0.001* (0.001)	-0.044*** (0.004)
Homeowner (dummy)	0.049*** (0.006)	0.000 (0.002)	-0.020*** (0.006)	-0.006* (0.004)	-0.012*** (0.003)	-0.001 (0.002)	-0.009 (0.007)
<i>Observations</i>				136868			
<i>Log Likelihood</i>				-161271			

Notes: The standard errors in parentheses are clustered at the household level. The figures are marginal effects. The control variables include age dummies, gender, education, marital status, the number of children, wave dummies, region dummies, labour-force status and dummies for past unemployment over 4 years. \*, \*\*, \*\*\* stand for  $p < 0.1$ ,  $p < 0.05$  and  $p < 0.01$ .

Table A8: Economic insecurity and probability of supporting a party: logit results – heterogeneity in BHPS and SOEP

<b>Panel A: BHPS</b>	Males	Females	Married	Not Married	Children	No Children
Economic Insecurity (std)	0.005* (0.003)	0.010*** (0.003)	0.011*** (0.003)	0.003 (0.003)	0.019*** (0.003)	0.000 (0.002)
Log(Eq. HH Income) (std)	0.021*** (0.003)	0.021*** (0.003)	0.022*** (0.003)	0.021*** (0.003)	0.029*** (0.004)	0.015*** (0.003)
Homeowner (dummy)	0.018** (0.007)	0.036*** (0.007)	0.027*** (0.007)	0.026*** (0.008)	0.030** (0.012)	0.022*** (0.006)
<i>Observations</i>	31124	36720	42303	25538	28563	39281
<i>Log Likelihood</i>	-16924	-21284	-23085	-15132	-16786	-21444
<b>Panel B: SOEP</b>	Males	Females	Married	Not Married	Children	No Children
Economic Insecurity (std)	0.006*** (0.002)	0.012*** (0.002)	0.014*** (0.002)	0.006** (0.003)	0.013*** (0.003)	0.008*** (0.002)
Log(Eq. HH Income) (std)	0.025*** (0.005)	0.038*** (0.004)	0.058*** (0.006)	0.014*** (0.004)	0.044*** (0.006)	-0.028*** (0.004)
Homeowner (dummy)	0.027*** (0.008)	0.026*** (0.007)	0.038*** (0.008)	-0.003 (0.009)	0.034*** (0.009)	0.018** (0.008)
<i>Observations</i>	100433	109167	141574	68026	92623	116977
<i>Log Likelihood</i>	-65263	-67308	-89693	-42722	-57315	-75286

Notes: The standard errors in parentheses are clustered at the household level. The figures are marginal effects. The control variables include age dummies, gender, education, marital status, the number of children, wave dummies, region dummies, labour-force status and dummies for past unemployment over 4 years. \*, \*\*, \*\*\* stand for  $p < 0.1$ ,  $p < 0.05$  and  $p < 0.01$ .

Table A9: Robustness checks – logit results

	Support a Party in t+1								Interest in politics in t+1	
	BHPS	SOEP	BHPS	SOEP	BHPS	SOEP	BHPS	SOEP	BHPS	SOEP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Econ. Insec. (std)	0.004** (0.002)	0.005*** (0.001)	0.007*** (0.002)	-0.010*** (0.002)					0.009** (0.004)	0.013*** (0.003)
Log(Eq. HH Inc.) (std)	0.011*** (0.002)	0.016*** (0.002)	0.019*** (0.002)	0.030*** (0.004)	-0.016*** (0.002)	0.028*** (0.003)	0.016*** (0.002)	0.025*** (0.003)	0.045*** (0.005)	0.052*** (0.006)
Homeowner (dummy)	0.017*** (0.005)	0.013*** (0.003)	0.023*** (0.006)	0.026*** (0.006)	0.027*** (0.005)	0.028*** (0.006)	0.026*** (0.005)	0.029*** (0.006)	0.022* (0.011)	0.046*** (0.010)
Hacker's Index					0.000 (0.006)	0.023*** (0.005)				
Variance HH Income							0.002 (0.002)	0.006** (0.003)		
<i>Controlling for:</i>										
<i>Political pref. in t-1</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Life Satisfaction</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Observations</i>	67844	209600	62151	209600	67844	209795	67844	209795	48109	206152
<i>Log Likelihood</i>	-31938	-102672	-34995	-132754	-38326	-132759	-38326	-132968	✓	✓
<i>Adjusted R<sup>2</sup></i>	✓	✓	✓	✓	✓	✓	✓	✓	0.164	0.192

Notes: The standard errors in parentheses are clustered at the household level. The figures are marginal effects. The control variables include age dummies, gender, education, marital status, the number of children, wave dummies, region dummies, labour-force status and dummies for past unemployment over 4 years. ✓, \*\*, \*\*\* stand for  $p < 0.1$ ,  $p < 0.05$  and  $p < 0.01$ .

Table A10: Descriptive statistics – UAS

	Mean	SD	Min	Max
<i>Political Preferences:</i>				
Prob to vote	85.092	31.520	0	100
Probability to Vote for Trump	43.458	45.188	0	100
Probability to Vote for Clinton	40.397	44.643	0	100
Probability to Vote for Other	16.103	32.093	0	100
<i>Sociodemographic Variables:</i>				
Equivalized HH Income (log)	9.712	1.298	6.196	12.401
Economic Insecurity	-93.248	1083.788	-4990.559	4964.772
Age	42.111	11.217	18	65
Female	0.599	0.490	0	1
Married	0.591	0.492	0	1
Separated	0.019	0.137	0	1
Divorced	0.141	0.348	0	1
Widowed	0.014	0.117	0	1
No. HH Members	2.980	1.483	1	11
Employed	0.718	0.450	0	1
Unemployed	0.081	0.272	0	1
Out of the Labour Force	0.201	0.401	0	1
Observations	2358			

Table A11: Descriptive statistics – UKHLS

	Mean	SD	Min	Max
<i>Political Preferences:</i>				
Leave the EU	0.407	0.491	0	1
<i>Sociodemographic Variables:</i>				
Equivalized HH Income (log)	10.080	0.596	3.913	11.874
Economic Insecurity	-2304.543	10180.340	-44663.600	33999.380
Homeowner	0.728	0.445	0	1
Age	42.868	10.736	19	65
Female	0.569	0.495	0	1
Married	0.585	0.493	0	1
Separated	0.022	0.148	0	1
Divorced	0.085	0.278	0	1
Widowed	0.010	0.101	0	1
Never Married	0.297	0.457	0	1
Number of Children in HH	0.765	1.034	0	9
Employed	0.821	0.384	0	1
Unemployed	0.042	0.201	0	1
Out of the Labour Force	0.137	0.344	0	1
Observations	13381			

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