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To cite this article: George Asiamah (2025) Divorced but co-habiting: a co-evolutionary perspective on EU-UK regulatory nexus post-Brexit, Journal of European Integration, 47:5, 653-673, DOI: [10.1080/07036337.2024.2407094](https://doi.org/10.1080/07036337.2024.2407094)

To link to this article: <https://doi.org/10.1080/07036337.2024.2407094>



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Published online: 24 Sep 2024.



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# Divorced but co-habiting: a co-evolutionary perspective on EU-UK regulatory nexus post-Brexit

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## ABSTRACT

In the aftermath of Brexit, the EU and the UK find themselves in an uncharted regulatory territory, similar to a divorced couple navigating the complexities of cohabitation. This article combines concepts from co-evolutionary theory with relational metaphors such as marriage, divorce, and co-habitation, offering a novel framework to analyse the unprecedented transition from EU member state to ex-member. The article uses food safety and gene editing regulations as case studies to illustrate the dynamics of this relationship. In food safety, both the EU and the UK maintain high standards rooted in past crises, reflecting a mutualistic co-evolutionary pathway. Conversely, in gene editing, the UK's pursuit of a more liberal regulatory framework represents a competitive co-evolutionary trajectory, prompting the EU to reconsider its regulatory stance. This analysis unveils the complex reality of the post-Brexit EU-UK regulatory relations, marked by a continuous process of adaptation and influence.

## KEYWORDS

Brexit; Brussels Effect; co-evolutionary theory; Europeanisation; food safety; gene editing

## 1. Introduction

The United Kingdom's (UK) departure from the European Union (EU) marked a significant milestone in the history of both entities, symbolised emotionally as members of the European Parliament linked arms and serenaded the UK with the strains of 'Auld Lang Syne' (BBC 2020). This moment, steeped in symbolism and emotion, raised questions about the nature of the relationship that would ensue post-Brexit. The question, as echoed in the opening lines of the farewell anthem, is whether these 'auld acquaintances' can truly be 'forgot' or if their shared history will continue to shape their relationship in profound ways.

Traditionally, the dynamics of the EU's relationships with other countries have been conceptualised through frameworks such as Europeanisation (Börzel and Risse 2003; Radaelli 2003), which primarily applies to member states and candidate countries, and the Brussels Effect (Bradford 2012, 2020), which describes the EU's regulatory influence on non-member states. However, the unique case of the UK's transition from a member state

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to an ex-member presents a novel case that these existing theories do not fully encapsulate.

This article combines concepts from co-evolutionary theory with relational metaphors of marriage, divorce, and cohabitation, proposing a distinctive framework to analyse the evolving relationship between the EU and the UK. Co-evolutionary theory, which originates from biology and has been adapted to organisational and social sciences (Edmondson, Kern, and Rogge 2019; Thompson 1994; Van Assche et al. 2022), provides a useful framework for understanding how entities with a common history and shared environment continue to influence each other and adapt over time in a mutualistic or antagonistic manner. This framework interprets the EU-UK regulatory relationship through the narrative arc of a marital journey. It chronicles the transition from a period of harmonious union within the EU, characterised by collaborative governance and regulatory alignment, through the contentious phase culminating in Brexit – reminiscent of a divorce – and onward into a post-divorce scenario marked by complex cohabitation.

The article uses food safety and gene editing regulations as case studies. These sectors are particularly salient for several reasons. Firstly, they represent fields of significant public interest and policy debate (Burns 2012). Secondly, the EU has been a global regulatory leader in these domains, exemplifying the Brussels Effect's reach (Bradford 2020). Thirdly, they illustrate areas where the UK, as a long-time EU member, had conformed to EU regulations, making post-Brexit divergences or convergences particularly consequential for broader political and trade relationships (Thissen et al. 2020).

This article provides a more complex picture of the post-Brexit regulatory landscape, acknowledging the ongoing interdependencies and mutual adaptations between the EU and the UK. Also, the use of relational metaphors offers a relatable and humanised narrative that captures the essence of the UK-EU dynamics in a way that purely political or economic analyses cannot depict.

## 2. Theoretical foundation

The theoretical foundation of this study is rooted in the interplay between Europeanisation, the Brussels Effect, and co-evolutionary theory, with a focus on how the latter fills the conceptual gaps left by the other two in understanding post-Brexit EU-UK relations. Europeanisation has been a key concept in understanding the impact of the EU on its member states and candidate countries (Bache 2008; Börzel and Risse 2003; Radaelli 2003). It encompasses various processes through which the EU's political, legal, and economic dynamics shape the domestic structures and policies of its members and candidate countries like Turkey and Georgia (Börzel and Soyltin 2012). Despite the advancement in the Europeanisation literature, most studies largely focus on the transformative convergence among member states, which becomes less applicable in the context of a member state leaving the Union.

Post-Europeanisation literature focuses on the implications of Brexit and how the UK's regulatory framework evolves after leaving the EU. Burns et al. (2020) have explored 'de-Europeanisation,' examining how former member states undo or modify the EU-induced changes to their domestic policies and structures. Armstrong (2021) and Barnard (2019) also explored the implications of Brexit on the UK's regulatory landscape, particularly in relation to EU law and governance

structures. Asiamah (2024) and Keating (2022) focus on the broader implications of regulatory divergence for consumer protection, competition, and market dynamics, providing insights into the practical challenges and opportunities arising from Brexit. However, most of the post-Europeanisation literature overlooks the potential for reciprocal relationships between the two entities.

The Brussels Effect (Bradford 2012, 2020) articulates another dimension of the EU's influence, focusing on its ability to set regulatory standards globally, even without formal jurisdiction over non-member states. The Brussels Effect operates through the EU's regulatory power in its internal market, which is so significant that it effectively sets global standards. Non-EU countries and multinational corporations frequently adopt EU standards to maintain access to its large market, leading to the harmonisation of regulations and practices across borders (Bradford 2012). Asiamah (2024) integrated the Brussels effect into de-Europeanisation framework to explain the EU's continued influence on UK's post-Brexit regulatory decisions. However, the Brussels Effect primarily emphasises the EU's influence outward and does not fully account for the reciprocal influences or the complex interdependencies that can exist between the EU and a former member state.

Co-evolutionary theory, derived from evolutionary biology, describes the simultaneous evolution of two or more species that exert selective pressures on each other (Thompson 1994). This concept has been applied to various fields, including sociology, economics, and organisational studies, to illustrate how entities that interact can mutually influence each other's development over time (Edmondson, Kern, and Rogge 2019; Van Assche et al. 2022). In the context of EU-UK relations post-Brexit, this theory fills critical gaps left by the traditional conception of Europeanisation and the Brussels Effect. Unlike Europeanisation and the Brussels Effect, which emphasise EU-centric influence, co-evolutionary theory acknowledges the reciprocal nature of influence between the EU and the UK. It posits that their shared history and continued economic ties lead to a relationship characterised by mutual adaptation and influence. The co-evolutionary approach recognises the non-linear and complex nature of regulatory changes (Edmondson, Kern, and Rogge 2019). It moves beyond the notion of convergence or divergence to understand the nuanced interplay of policies and standards that evolve in response to each other's changes.

### 3. Analytical framework

This article develops a novel analytical framework to examine the evolving post-Brexit relationship, drawing on co-evolutionary theory, Europeanisation, and the relational metaphors of marriage, divorce, and cohabitation. This approach posits that the EU and UK are entrenched in a dynamic process of reciprocal learning and adaptation, influenced by their intertwined histories, continuous negotiations, and mutual policy adjustments. It employs a three-part framework that aligns with the chronological phases of their association: the pre-Brexit, Brexit, and the post-Brexit phase. Each case study will follow this structured approach, as outlined in the following subsections, ensuring a coherent and comprehensive analysis across the different regulatory domains.

### ***3.1. Pre-brexit phase: europeanisation as marriage***

At the initial stage of the framework, the period of the UK's EU membership is conceptualised metaphorically as a 'marriage,' representing a time of deep integration, mutual commitment, and shared governance. This phase is underpinned by the concept of Europeanisation, which encapsulates the process through which the EU's political, legal, and economic frameworks influenced the UK's domestic structures and policies. The marriage metaphor captures the essence of this period, characterised by harmonisation and collaboration, yet also marked by disputes and negotiations reflective of any partnership. This baseline phase sets the context for understanding the depth of integration and the implications of subsequent separation.

### ***3.2. Brexit phase: the divorce process***

The Brexit process is likened to a 'divorce,' marking the transition from integration to separation. This phase of the framework examines the challenges and negotiations involved in disentangling the UK from the EU's systems, highlighting the complexity of redefining relationships, establishing new trade agreements, and navigating the legal ramifications of separation. The divorce metaphor aptly describes the contentious and often complex negotiations that characterised this period, underscoring the difficulties inherent in dissolving long-standing partnerships.

### ***3.3. Post-brexit phase: co-habitation dynamics***

Post-Brexit, the relationship between the EU and the UK enters a phase of co-habitation, reflecting a new equilibrium of interaction based on mutual adaptation, shared history, and ongoing interdependencies. This stage is informed by co-evolutionary theory, which suggests that entities with intertwined histories continue to influence each other's development in a dynamic and reciprocal manner. This part of the framework entails analysis of four key dimensions:

**Regulatory Interdependence:** Co-evolutionary theories emphasise mutual shaping and interdependence, explaining how entities influence each other's trajectories and the interdependence of their development (Edmondson, Kern, and Rogge 2019; Van Assche et al. 2022). This dimension examines how the EU's and UK's regulations are interconnected. It includes shared economic interests, such as trade in goods and services, and legal interdependencies that have developed over time due to the UK's previous membership in the EU. It also considers how regulatory frameworks in areas such as financial services, environmental standards, and consumer protection remain interconnected.

**Path Dependency:** Path dependency emphasises how past interactions and adaptations between entities can create 'lock-in' effects that influence the direction and outcomes of future evolutionary changes (MacKinnon 2008; Thompson 1994). Historical decisions and established regulatory practices between the EU and the UK significantly shape their current regulatory environment. This historical context can either constrain or guide the direction of new regulatory frameworks. For instance, the UK's adherence to certain EU standards may persist due to their deep integration and the practical

challenges of diverging too significantly, which could impact sectors like the agri-food industry.

**Response to External Pressures:** Co-evolutionary theories consider environmental dynamism and co-evolution, explaining how entities respond and adapt to external pressures and changes in their environment (Thompson 1994; Van Assche et al. 2022). Both the EU and the UK operate within a broader global context that influences their regulatory decisions. This component analyses how external factors, such as global economic trends, technological advancements, and geopolitical shifts, may exert influence on the regulatory evolutions of both the EU and the UK. For example, global trade dynamics, climate change policies, and international security concerns necessitate coordinated responses.

**Adaptive Responses and Policy Feedback Loops:** In the context of co-evolution, adaptive responses refer to how the EU and UK adjust their regulatory policies in reaction to changes made by the other (Edmondson, Kern, and Rogge 2019; Van Assche et al. 2022). Adaptive responses can be cooperative, where changes are made to maintain alignment, or competitive, where changes are made to create regulatory advantages. For instance, if the EU tightens environmental regulations, the UK might follow suit to ensure its products remain compatible with EU market standards, reflecting a cooperative adaptation. Conversely, the UK might seek competitive advantages by offering more flexible regulatory frameworks in financial services to attract investment post-Brexit, potentially leading to competitive divergence.

#### 4. Methodology and method of study

The study adopted a qualitative case study research methodology, using food safety and gene editing regulations as case studies. These cases were selected because of their relevance to public policy, trade, innovation, and the broader geopolitical dynamics influencing the EU-UK relationship (Alemanno 2013). Furthermore, the selected cases represent areas of regulatory disparity and alignment, providing a holistic perspective of the regulatory dynamics between the two blocs.

The primary method of study was document analysis. The study began with a review of academic literature to gain theoretical insights into co-evolutionary theory, Europeanisation, and the Brussels Effect. A comprehensive review of legislation, policy briefs, and statements issued by the EU and UK regulatory bodies and government departments. The study also reviewed analyses reports from think tanks, research institutions, and international organisations. These publications were sourced from the official websites of the respective organisations, ensuring the reliability and relevance of the information. Additionally, articles from reputable news organisations, particularly the BBC, were utilised to complement the analysis. These articles provided contemporary accounts of the evolving regulatory relationship, public perceptions, and the socio-political implications of the EU-UK dynamics in the areas under study.

Thematic analysis was used as the primary analytical technique for extracting relevant themes, patterns, and insights from the collected data. This involved a detailed coding process where data were organised into meaningful categories related to cooperation, competition, autonomy, interdependence, and the various factors influencing the evolutionary dynamics of regulatory policies in the post-Brexit context.

## 5. Case study one: food safety regulatory regime

This section analyses the evolution of the food safety regulatory regime between the EU and the UK, examining the transition from fragmented national regulations to a unified framework and the subsequent effects of Brexit. Following the analytical framework, the section is divided into three key sub-sections that explore the historical development of food safety governance within the EU, the collaborative regulatory environment pre-Brexit, the implications of Brexit, and the adaptive strategies employed by both entities to navigate the post-Brexit landscape.

### 5.1. *The EU-UK food safety regulatory 'matrimony'*

The evolution of food safety governance in the EU prior to the 2000s reflects a tale of moving from the solitude of national sovereignty to the companionship of a unified EU-wide regulatory approach. Initially, food safety norms were like individual households, with each EU member state crafting and enforcing its own rules and guidelines (Asiamah 2022). The 1990s, however, marked a critical period for food safety in the EU, characterised by a series of high-profile food safety crises that such as the Bovine Spongiform Encephalopathy (BSE) crisis in the UK, the Swine Fever Epidemic in the Netherlands, and the Dioxin Crisis in Belgium. These crises served as a wake-up call for the EU, revealing the inadequacies of isolated actions to food safety issues in an increasingly interconnected world.

The post-2000s era marked the consummation of the EU-UK food safety regulatory matrimony, with the General Food Law Regulation (EC) No 178/2002 serving as the symbolic marriage certificate of this union. This legislation unified the EU and the UK under a shared vision for food safety and laid down the foundational vows for their commitment to protect public health and ensure the free movement of safe food across their borders. The European Food Safety Authority (EFSA), with its mandate for scientific excellence and impartial advice, became the cornerstone of the EU-UK partnership in ensuring food safety, symbolising the shared space where their regulatory lives intertwined. The Rapid Alert System for Food and Feed (RASFF), similar to a joint communication system, ensured that this union remained strong, responsive, and capable of protecting the well-being of its family – the citizens of the EU and the UK – from any food safety hazards.

Over time, the EU developed numerous stringent food regulations covering all the various stages of the agri-food value chain (Asiamah 2022). The UK, sharing its life within the EU household, embraced these regulations wholeheartedly (Dreyer and Renn 2009; Wardman and Boudier 2022). These regulations included a tougher authorisation regime and stricter labelling requirements for certain products, and rigorous safety limits for additives (Regulation (EC) No. 1333/2008), pesticides (See Regulation (EC) 396/2005), veterinary medicines (Regulation (EC) 470/2009), and food contact materials (Regulation (EU) No 10/2011). Regulations on food ingredients, composition, and additives prohibit the use of certain substances or foods in the single market unless they have been approved by the Commission (Examples include Regulation (EC) No. 1333/2008 on food additives; Regulation (EC) No. 1334/2008 on food flavourings; Regulation (EC) No. 2065/2003 on smoke flavourings; Regulation (EC) No. 1925/2006 on vitamins and minerals used

in food and foods). In some cases, like the use of chlorine in treating poultry carcasses, substances banned in the EU are widely used in other countries.

The UK's Food Standards Agency (FSA) and EFSA became close partners, sharing insights, developing risk management strategies, and jointly enforcing food safety regulations. Additionally, UK scientists, interest groups, and policymakers played vital roles in the formulation of the EU's food safety regulations, contributing expertise and insights that helped to refine and strengthen the regulatory framework (Asiamah 2022; Dreyer and Renn 2009). The harmonisation of regulatory standards and the integration of markets within the EU facilitated trade creation and the extension of supply chains. Businesses were empowered to source materials more efficiently from other countries, bolstering economic integration and competitiveness (Swinbank 2018). The RASFF played a crucial role in the smooth exchange of data and documents between trading partners and control authorities, enhancing the efficacy of the EU's food safety net (Pigłowski 2022).

## **5.2. *Brexit and the 'post-divorce' agreements***

The EU-UK Withdrawal Agreement served as a landmark treaty (divorce paper) that formalised the official separation or the departure of UK from the EU. The Withdrawal Agreement marked the culmination of a complex and contentious process that began with the UK's referendum on EU membership on 23 June 2016. Following the Agreement, the UK passed the European Union Withdrawal Act, ending the supremacy of EU laws, rules, principles, and institutions on the UK's domestic regulatory processes. However, the Act converted all legislation that originated from the EU before the exit day, both direct and derived, into UK domestic laws, which was referred to as the 'retained EU laws.'

The Withdrawal Agreement includes several protocols and annexes that address specific areas of concern. The Protocol on Ireland/Northern Ireland, commonly referred to as the Northern Ireland (NI) Protocol, is a crucial component of the Agreement designed to avoid a hard border between Northern Ireland (part of the UK) and the Republic of Ireland (an EU member state). It ensures that Northern Ireland remains aligned with certain EU rules (See Article 5 of the NI Protocol), particularly concerning goods, while the rest of the UK diverges. This alignment was intended to protect the 'Good Friday Agreement' and maintain peace and stability on the island of Ireland.

According to Article 5 of the Northern Ireland Protocol, goods moving from Great Britain to Northern Ireland are subject to EU customs rules, creating a regulatory and customs border in the Irish Sea. This ensures compliance with EU standards, avoiding checks at the land border with the Republic of Ireland. Northern Ireland must follow EU rules on goods, agriculture, and food safety. In 2023, the 'Windsor Framework' introduced a dual-lane system: 'Green Lane' for NI-bound goods with minimal checks and 'Red Lane' for EU-bound goods with standard checks. This framework aimed to address governance concerns and streamline trade processes.

The culmination of these negotiations was the UK-EU Trade and Cooperation Agreement (TCA), which outlined the framework for free trade and socio-political cooperation between the UK and the EU. The TCA served as a post-divorce agreement, ensuring the continuance of tariff-free and quota-free trade in goods between the two entities. This agreement laid out protocols for Sanitary and Phytosanitary (SPS) measures

(see Article 87 of the TCA), crucial for safeguarding human, animal, and plant health, mirroring the ongoing responsibilities shared in their previous union. It established a specialised committee to monitor the implementation of these SPS measures, symbolising a commitment to collaborative oversight, regular reviews, and open channels for information exchange.

### **5.3. Post-divorce food safety regulatory dynamics**

#### **5.3.1. Customised cooperation: tailoring post-divorce regulatory relationships**

The underlying governance arrangements between the EU and UK continue to reflect a highly interrelated system, underscored by complex geographical, political, and economic ties that persist beyond Brexit. Within this framework, the NI protocol and UK-EU TCA plays a pivotal role in sustaining a dynamic yet cohesive regulatory environment for food safety governance. First, the NI Protocol keeps Northern Ireland in a form of a semi-matrimonial regulatory relationship with the EU, effectively placing part of the UK under continued EU regulations. This arrangement ensures automatic dynamic regulatory alignment with some core elements of the EU *acquis*, meaning Northern Ireland must follow changes to EU rules as they happen. For instance, the new EU standards on arsenic levels (Commission Regulation (EU) 2023/465) in baby food automatically applied to Northern Ireland, while generating discourse within Great Britain on whether to align or not.

Conversely, the TCA, while not incorporating automatic dynamic regulatory alignment, includes provisions to ensure high food safety standards through SPS measures. Article 87 of the TCA establishes a Specialised Committee on SPS Measures, which oversees the implementation of these provisions and facilitates ongoing dialogue between the EU and the UK. This committee acts like a family counsellor, helping to maintain cooperation and resolve disputes to ensure both parties adhere to agreed food safety standards. For example, in recent SPS Committee meeting, the UK highlighted the need for timely sharing of information on food safety incidents and has proposed technical discussions to establish clearer mechanisms for handling cross-border food safety events. As a response, the EU adjusted how it sends RASFF notifications, switching from bulk notifications at the end of the day to real time notification (DEFRA 2023). The EU also stressed the importance of transparent SPS import conditions and procedures, urging the UK to notify any changes according to WTO rules. These ongoing discussions reflect the continuous effort to manage their complex regulatory relationship, much like maintaining a cordial relationship with an ex-partner for the sake of mutual interests.

Moreover, Preamble 7 of the TCA enshrines a mutual commitment to maintain high protection levels across various domains, including food safety. This mutual commitment is critical, as any adjustment in regulatory standards by either party holds the potential to significantly influence market access and competitive positioning. The agreement, therefore, necessitates a careful consideration of each other's regulatory frameworks during policy development, ensuring that changes do not unduly impact bilateral trade dynamics.

#### **5.3.2. Living apart together: the path dependency paradox**

The integrated supply chains between the EU and the UK, cultivated over years of membership in the Single Market, illustrates a depth of path dependency. These supply

chains, characterised by high levels of interdependence, create a scenario where it is challenging to reinvent or significantly alter regulatory frameworks without causing substantial disruptions. For instance, the UK remains the largest export destination for EU agri-food products, and vice versa (European Commission 2024; ONS 2023), compelling producers in both blocs to adhere to each other's regulatory standards to facilitate trade. The British Specialist Nutrition Association (BSNA) exemplifies this dynamic by committing to manufacture to the new EU standards on arsenic residue (Commission Regulation (EU) 2023/465), prioritising market access over regulatory autonomy (BBC 2023). Such decisions highlight the influence of historical trade patterns on current regulatory practices and future directions.

Moreover, the current EU/UK food safety framework is also a product of historical crises that have shaped regulatory approaches and public trust (Asiamah 2022). The BSE and similar food safety crisis within the EU led to a loss of confidence in scientific advisory and regulatory institutions. The response to this crisis, including the implementation of shared risk governance guidelines and coordinated risk communication strategies, has significantly influenced the development of current food safety regulations (Lofstedt 2011). These measures, designed to rebuild public trust, have become embedded within the regulatory culture, suggesting a high degree of path dependency that favours continuity over radical change.

The institutionalisation of regulatory principles, norms, and culture, resulting from decades of collaboration and coordination between the UK and EU, has deeply embedded these values within domestic institutions. For example, the FSA's five-year strategy for 2022–2027 shares the same principle as the EU's farm-to-fork strategy, which underscores a commitment to maintaining high standards of food safety and animal welfare across the entire food supply chain as opposed to other countries like the US that prioritise efficiency and market-driven approaches over stringent regulatory standards (FSA 2022). This arrangement reflects the entrenched nature of regulatory frameworks influenced by a shared history and the mutual benefits derived from harmonised standards.

Furthermore, consumer and stakeholder resistance to lowering food safety standards, such as the widespread rejection of chlorine-washed chicken (Asiamah 2024), highlights the ongoing public expectation for high standards, which was cultivated during the UK's membership in the EU. This phenomenon does not necessarily mean a direct alignment with EU regulations, or a regulatory pull exerted by the EU but rather reflects a parallel evolution of regulatory standards in both entities, shaped by their shared history and the foundational principles that have governed their relationship for decades. Also, despite the Retained EU Law (Revocation and Reform) Act's intention to review EU-derived laws, key food safety regulations remain intact (DEFRA 2023). The new Labour government has also expressed commitment to high standards, as seen in the proposed 'Product Safety and Metrology Bill,' which allows for the incorporation of updates to EU product safety rules introduced post-Brexit (Prime Minister's Office 2024).

### ***5.3.3. The global neighbourhood: external dynamics post-separation***

The dynamic interplay between trade liberalisation efforts and the maintenance of stringent food safety standards poses a significant challenge for the UK in the post-Brexit era. As the UK navigates its new status outside the EU, the pursuit of trade agreements with major economies, such as the US, Australia and Canada – typifies the

tension between economic ambitions and the commitment to high food safety standards that have long been a hallmark of both UK and EU regulatory frameworks.

The debate over chlorinated chicken – meat products rinsed in chlorinated water to reduce microbial contamination – serves as a symbol of the broader regulatory and cultural clash between the UK (and by extension, the EU) and the US (Asiamah 2024). The EU's prohibition of such pathogen reduction treatments (PRTs), as outlined in EC Regulation No. 853/2004, is rooted in a comprehensive approach to food safety that emphasises hygiene throughout the production process, rather than end-point treatments. This approach, which the UK has historically shared with the EU, contrasts sharply with US practices, where PRTs like chlorine washing are commonplace. The divergence reflects not just different regulatory standards but also contrasting philosophies regarding food safety and consumer protection. Similarly, the EU's ban on growth hormones in livestock, as per Directive 81/602/EEC, underscores another area of significant divergence between EU (and UK) standards and those of other trade partners such as the US, Canada, and Australia. The World Trade Organisation's (WTO) mixed ruling on this issue (WTO 2008) highlighted the complexities of reconciling these differences in the context of international trade.

As the UK seeks to carve out new trade agreements, the pressure to conform to the regulatory expectations of potential partners like the US (USTR 2019) could potentially lead to a softening of its food safety standards. However, this potential regulatory shift is met with considerable resistance within the UK from various stakeholders, including farmers' groups and NGOs, who advocate for the maintenance of high food safety and animal welfare standards (Asiamah 2022, 2024). The National Farmers Union (NFU) has been particularly vocal, criticising trade deals with countries like Australia and New Zealand for potentially undermining UK standards by opening the market to significant volumes of imported food that may not meet these high standards (House of Commons International Trade Committee 2022; NFU 2019). The negotiations between the UK and US have been emblematic of these challenges, with significant differences in food standards contributing to a standstill in discussions (USTR 2019). This impasse underscores the broader dilemma facing the UK: balancing the economic imperative of securing new trade deals with the commitment to maintain smooth trade relations with the EU.

#### ***5.3.4. Sharing the regulatory roof: adaptive strategies and feedback mechanisms***

Post-Brexit, the EU and the UK find themselves in a shared regulatory 'house,' necessitating adaptive strategies and feedback mechanisms that reflect their ongoing cohabitation. Just as former partners navigate the shared spaces of a home, the EU and the UK continuously adapt their regulatory frameworks to accommodate each other's decisions and maintain harmony. For instance, the UK's consideration of diverging from certain EU food safety standards prompted discussions within the EU on safeguarding its market from potential risks (Gkrintzali et al. 2023). Similarly, the EU's regulatory changes continue to influence decisions by UK stakeholders, especially in areas where alignment is crucial for trade. The BSNA decision to comply with new EU chemical levels in baby foods to preserve export rights illustrates this adaptive response (BBC 2023).

Moreover, the outcomes of regulatory changes significantly shape stakeholder opinions, political debates, and future policy directions, creating a feedback loop that informs subsequent adjustments. In the UK, public and stakeholder resistance to lowering food

safety standards in pursuit of trade agreements underscores the societal value placed on high standards of food safety and animal welfare (Asiamah 2022, 2024). This resistance has become a critical factor in the UK's policy-making process, ensuring that any potential regulatory divergence considers the expectations and preferences of UK consumers and producers.

Another example of this dynamic interplay is the UK's decision to delay the implementation of full post-Brexit border controls on imports from the EU, originally scheduled for 2021 but pushed back several times (NFU 2023). This decision, influenced by concerns about supply chain disruptions and the readiness of businesses to comply with new requirements, reflects an adaptive response to immediate economic pressures and stakeholder feedback. It underscores the challenges the UK faces in establishing a fully independent regulatory regime while maintaining smooth trade relations with the EU.

On the EU side, even though significant responsive changes have not been observed, the bloc's vigilance regarding the UK's potential regulatory divergence, especially concerning food safety standards, illustrates a proactive stance in safeguarding its single market and consumer health (European Commission 2022). The EU's insistence on adherence to its SPS measures in trade agreements with the UK reflects a strategic response aimed at preventing any undermining of its food safety regime (European Commission 2022). The EU's position is also shaped by internal stakeholder pressures, including from agricultural sectors and consumer advocacy groups, who demand that the bloc maintain its high standards and not compromise in the face of external pressures (Ververis et al. 2020).

The NI Protocol and its subsequent adjustment, the 'Windsor Framework,' serve as a microcosm of the broader regulatory and political challenges faced by the EU and UK in reconciling their food safety regimes post-Brexit. The protocol's implementation has been fraught with difficulties, illustrating the complexities of managing food safety standards within a divided regulatory landscape (HM Government 2023). The continuous dialogue and negotiation required to address these challenges underscore the importance of adaptability and cooperation in ensuring the protocol's success while minimising disruptions to trade and consumer protections (European Commission 2022).

Additionally, the establishment of mechanisms such as the Specialised Committee on SPS measures under the UK-EU Trade and Cooperation Agreement (TCA) facilitates continuous dialogue and negotiation. This allows for the timely addressing of regulatory discrepancies and emerging issues. This structured approach to regulatory governance ensures that both the EU and the UK can adapt to changes in a manner that supports trade continuity, protects consumer health, and reflects the evolving policy landscape.

## 6. Case study two: gene editing regulations

This section analyses the intricate journey of gene editing regulations between the EU and the UK, highlighting the transition from a unified regulatory framework to the distinct post-Brexit regulatory landscapes. The analysis delves into the historical development of GM regulations, the implications of Brexit, and the adaptive strategies employed by both entities in the evolving field of gene editing.

### **6.1. The shared journey of EU-UK GM regulations**

The narrative of gene editing and genetically modified organism (GMO) regulations within the EU and the UK mirrors the evolving chapters of a marital journey, marked by shared aspirations, collaborative efforts, and occasionally, moments of discord. This story commences with key events such as the birth of Dolly the Sheep, the introduction of the first GM crops, and the subsequent development of regulatory frameworks in response to these innovations (Gaskell et al. 2000).

In the formative years, the UK and the EU embarked on their regulatory cohabitation, with the UK initially managing its novel foods and GMOs through a domestic framework. However, the early 1990s brought about a harmonisation of laws across the EU, particularly with directives such as 90/220/EEC and later 2001/18/EC, bringing UK's regulatory regimes more closely to the EU. This harmonisation process, embodying the essence of their regulatory matrimony, was aimed at ensuring a consistent, market-wide approach to the risk assessment, approval, and monitoring of GM products.

Within the shared home of EU-wide regulations, the UK's Food Standards Agency (FSA) and the Advisory Committee on Releases to the Environment (ACRE) contributed to and were influenced by the collective scientific assessments and decisions. However, there were instances of tension and disagreement, particularly regarding the pace of innovation and the adoption of new technologies (Levidow, Carr, and Wield 2005). The EU has traditionally taken a precautionary approach to GM technologies, reflecting public scepticism and concerns about safety and environmental impact. This has resulted in stringent regulatory assessments, labelling requirements, and in some cases, bans on GM crops by individual member states (Levidow, Carr, and Wield 2005). In contrast, the UK displayed a somewhat more open attitude toward GM research and potential agricultural applications, recognising the scientific consensus on the safety and benefits of GM crops under appropriate regulation (Royal Society 2018).

The discourse and protests on GM crops in other EU member states had a contagion effect, influencing the level and nature of activism within the UK. High-profile protests and the visible opposition in other EU countries were mirrored by similar movements in the UK (O'Brien 2021). This transnational activism contributed to a more contentious and polarised GM debate within the UK. An example of this cross-influence is the widespread adoption of GM-free zones by local authorities in the UK, inspired by similar initiatives in other EU regions (Horlick-Jones et al. 2007). Additionally, the lobbying efforts of environmental and consumer groups at both the EU and UK levels were instrumental in shaping the regulatory discourse, leading to more stringent labelling requirements and, in some cases, outright bans of GM crops (Levidow, Carr, and Wield 2005).

A landmark event in the history of EU GM regulations was the Court of Justice of European Union (CJEU) ruling in 2018, which classified organisms obtained by new gene-editing techniques as GMOs, subject to the strict regulations of Directive 2001/18/EC (CJEU 2018). This decision was met with criticism from the scientific community and some political leaders in the UK, who argued that it could hinder innovation and the development of more sustainable agricultural practices (Royal Society 2018). Critics contended that the ruling failed to distinguish between traditional GMOs and newer, more precise gene-editing techniques, such as CRISPR-Cas9, which could target specific genes without introducing foreign DNA (Royal Society 2018).

## **6.2. *Brexit: finalising the EU-UK gene editing regulatory divorce***

Brexit represented the final decree in the regulatory marriage between the UK and the EU regarding gene editing and GM regulations. The European Union Withdrawal Agreement (EUWA) formalised this separation. One of the immediate effects of the implementation of the EUWA was the severance of formal relationships between UK institutions, such as the Department for Environment, Food and Rural Affairs (DEFRA) and FSA, and EU institutions like EFSA. This change returned regulatory responsibilities, including the evaluation and authorisation of GM food and feed, back to UK institutions. While UK authorities may still consider EFSA's opinions and assessments, they are no longer bound by them, granting bodies like the DEFRA and FSA increased autonomy in determining the safety and regulatory status of gene-edited products within the UK.

Post-Brexit, the UK government signalled its intention to reassess its regulatory stance on GM and gene-editing technologies. A notable example of this shift was the consultation on proposals to ease regulations on gene-edited organisms (DEFRA 2021). This approach was formalised with the passage of the Genetic Technology (Precision Breeding) Act in 2023, marking a significant shift towards facilitating the development and approval of gene-edited crops and livestock. This legislative move underscored the UK's ambition to capitalise on the potential advantages of gene editing for sustainability and agricultural productivity, marking a definitive stride in the post-divorce era of EU-UK regulatory relations.

## **6.3. *Examining post-divorce dynamics in EU-UK GM regulatory affairs***

### **6.3.1. *A complex custody – interconnected isolation***

In the aftermath of their regulatory separation, the UK and the EU continue to find their gene editing and GMO regulations inextricably linked. The TCA sets the stage for the ongoing cooperation and alignment in various sectors, including regulations governing gene editing and GM organisms. The agreement does not specifically address gene editing technologies in detail but sets the stage for regulatory cooperation and alignment in areas of mutual interest, including the broad domain of SPS measures. This necessitates a level of dialogue and collaboration between the EU and UK to navigate the regulatory implications of emerging biotechnologies. It also emphasises the importance of maintaining a level playing field, especially in areas that affect trade and competition. This creates a delicate balance for the UK, which seeks to leverage its regulatory autonomy to foster innovation in gene editing, while also ensuring access to the EU market.

The NI Protocol, as it has been adjusted by the Windsor Framework, also introduces a unique regulatory challenge for gene editing and GM organisms. The protocol's aim to avoid a hard border on the island of Ireland results in Northern Ireland adhering to certain EU rules, including those concerning GM foods and feeds. This creates a dual regulatory regime within the UK itself, where different parts of the country operate under diverging standards for gene editing and GM organisms.

Moreover, EU regulations require that GM food and feed, including products developed using gene editing technologies, be labelled as such. This requirement stands as a significant point of divergence with the UK's post-Brexit approach, which may see gene editing as a less stringent regulatory category compared to traditional GM techniques.

The differing approaches to labelling and product approval can create challenges for trade, especially for products that move from the UK to the EU or vice versa. For NI farmers and producers, who must comply with EU regulations, divergence can put them at a competitive disadvantage, potentially increasing operational burdens and limiting market opportunities.

### **6.3.2. *Precautionary principle: joint custody of caution in innovation***

The EU's approach to GMOs and, by extension, gene editing, is deeply influenced by the precautionary principle. This principle, which prioritises caution in the face of scientific uncertainty to protect human health and the environment, has been a cornerstone of the EU's regulatory framework for GMOs. This approach is reflected in the stringent assessment, approval, and labelling requirements for GMOs within the EU, established through directives such as 2001/18/EC and regulations like (EC) No 1829/2003. The precautionary principle's deep integration into the EU's regulatory DNA makes it a path-dependent trajectory that significantly influences current and future regulatory decisions. This historical commitment to caution in the face of scientific uncertainty sets a high bar for any regulatory changes, especially those that might be perceived as lowering safety standards.

Post-Brexit, the UK has signalled its intention to diverge from the EU's stringent regulatory stance on gene editing, as evidenced by the passage of the Precision Breeding Act 2023. However, path dependency is evident in the resistance within different UK regions, such as Wales (BBC 2021) and Scotland (Scottish Government 2022), where there is hesitancy towards adopting the more liberal regulatory stance seen in England (FSA 2023a, 2023a). This divergence within the UK itself underscores the complexity of moving away from established regulatory paradigms. The historical integration with EU regulations and the differing views within the UK create a multifaceted path-dependent scenario, where decisions are influenced by previous regulatory frameworks, stakeholder expectations, and regional political considerations.

Institutional inertia and stakeholder expectations further compound the path dependency in both the EU and the UK. In the EU, the extensive regulatory apparatus built around the precautionary principle and GMO regulation, including EFSA and its risk assessment processes, creates a system resistant to rapid change. Stakeholder groups, including environmental NGOs and consumer advocacy organisations, exert significant influence, advocating for the maintenance of stringent GMO regulations (Corporate Europe Observatory 2018). In the UK, despite the national government's push for regulatory innovation in gene editing, institutional inertia is evident in the continued cautious approach in regions like Wales (FSA 2023a; BBC 2021) and Scotland (Scottish Government 2022). These regions reflect a broader societal apprehension towards GMOs and gene editing, mirroring the EU's precautionary stance.

### **6.3.3. *The global neighbourhood: adapting to external pressures post-separation***

The rapid pace of technological advancements in gene editing, particularly CRISPR-Cas9 technology, poses a significant external pressure to both the EU and UK regulatory regimes. Both blocs aim to be leaders in biotechnology, which requires regulatory frameworks that enable innovation. While traditionally cautious, the EU faces pressure to adapt its regulatory framework to keep pace with technological advancements (European

Commission 2021). The European Commission's study on New Genomic Techniques (NGTs) highlighted the rapid development of these technologies and their products, primarily outside the EU, indicating a global race in biotechnological innovation. The study also pointed out the EU's regulatory challenges, including enforcement and the differentiation of NGT products, suggesting a potential need for regulatory modernisation to remain competitive in the global biotechnology arena. Similarly, the UK's Genetic Technology (Precision Breeding) Act 2023 reflects an effort to streamline the approval process for gene-edited organisms, showcasing the UK's ambition to position itself as a biotech leader.

Additionally, international institutions such as WTO, OECD and FAO put a significant pressure on both the EU and UK to align with global standards. The WTO's emphasis on science-based regulations, as seen in the SPS Agreement, exerts pressure on both the EU and UK to align their gene editing regulations with global standards. Historical disputes, such as the challenge to the EU's moratorium on GMOs (Lieberman and Gray 2008), underline the importance of adherence to international norms to facilitate trade and avoid disputes. Additionally, the OECD and FAO's roles in promoting sustainable agriculture and food security (Henderson and Lankoski 2023) further influence the regulatory approaches of the EU and UK. By advocating for regulatory frameworks that balance the potential benefits of gene editing with safety and environmental considerations, these organisations encourage both entities to consider innovative yet cautious approaches to biotechnology regulation.

Moreover, free trade agreements (FTAs) with third countries also play a pivotal role in shaping the regulatory regimes of the EU and UK. The UK's trade negotiations and agreements with countries like the US, Japan and Australia, which have different stances on gene editing techniques pressures the UK to potentially align those trading partners. For the EU, maintaining a cohesive regulatory stance on gene editing while engaging in FTAs requires balancing the integrity of its precautionary approach with the economic benefits of trade liberalisation. For example, the Comprehensive Economic and Trade Agreement (CETA) between the EU and Canada, despite its aim to enhance trade, has led to trade disputes, underscoring the difficulties in aligning distinct regulatory approaches to biotechnologies in the realm of international trade (Thomsen 2016).

#### ***6.3.4. Joint custody of standards: feedback mechanisms in action***

The post-Brexit scenario has catalysed a dynamic interplay between the EU and UK gene editing regulatory regimes, characterised by adaptive responses and policy feedback loops. First, the UK's adoption of the Genetic Technology (Precision Breeding) Act 2023 serves as a prime example of adaptive response to the post-Brexit regulatory landscape. By creating a regulatory environment that is perceived as more conducive to innovation in gene editing, the UK aims to position itself as a leader in the biotechnology sector.

The EU, in contrast, has been prompted to reconsider its stance on gene editing considering the UK's regulatory changes and the broader global trend towards embracing these technologies (European Commission 2021). Although there has not been a direct legislative shift like the UK, the European Commission (2021) study signifies a potential openness to evolve the EU's regulatory framework. This indicates an adaptive response to both the competitive pressures in the global biotechnology market and the internal push for regulatory modernisation to keep pace with scientific advancements.

Moreover, the perceived regulatory divergence between the EU and UK has instigated feedback loops, influencing stakeholder opinions and political debates within and across both jurisdictions. In the UK, the government's progressive stance on gene editing has been met with a spectrum of reactions, from strong support within the scientific and agricultural communities to resistance from environmental and consumer advocacy groups. This divergence of opinions reflects the broader societal debate on balancing innovation with safety and ethical considerations. Similarly, in the EU, the deliberation over modernising gene editing regulations has sparked a multifaceted debate, reflecting a tension between the desire for innovation and the commitment to precautionary principles.

Furthermore, despite the divergence in formal policy positions, there is potential for institutional learning and regulatory convergence between the EU and UK. Regulatory bodies in both the EU and the UK will be observing each other's experiences with gene editing, which may lead to learning and adaptation of best practices. For example, FSA has indicated that it will continue to adopt certain risk assessment methodologies from the EU where possible (FSA 2023b), reflecting a shared understanding of how best to evaluate the safety of gene editing technologies.

## 7. Discussion: mutualism and competition in a shared space

The ongoing analysis of the post-Brexit relationship between the EU and the UK reveals a complex landscape of interdependence and divergence. The metaphor of a 'divorced but cohabiting' relationship provides a vivid illustration of their current situation, where despite the formal separation marked by Brexit, both parties continue to share a regulatory 'living space', necessitating ongoing interaction, negotiation, and adjustment. In this context, EUWA, the NI Protocol and the TCA act as the 'cohabitation agreement,' outlining the terms under which both entities interact within their shared regulatory domicile. These agreements ensure that, despite their divorce, the EU and the UK must continually engage with each other to manage the house they still co-occupy.

In the case of food safety, the EU and the UK demonstrate a form of mutualistic cohabitation. Like ex-partners who maintain a cordial relationship for the sake of shared commitments (in this case, public health and market stability), both parties have found a way to navigate their shared regulatory space with minimal friction. They continue to operate within a jointly constructed framework that, although no longer unified by membership, is still deeply interconnected through trade, shared standards, and the practical necessities of geographic proximity. This arrangement ensures that the basic functionalities of their shared space – safe food circulation and consumer protection – are maintained without major disruptions. However, this co-habitation is not without its challenges. The introduction of third-party interests – such as trade agreements with third countries – can strain this mutualistic relationship, like how external relationships can complicate family dynamics. Both the EU and UK must navigate these external pressures while maintaining the delicate balance of their co-habitation, ensuring that their regulatory house remains in order.

Conversely, the case of gene editing regulations demonstrates the competitive aspect of their co-habitation. Here, the UK has seized the opportunity to redecorate its regulatory space, adopting a more innovation-friendly approach to gene editing, in contrast to the

EU's more cautious stance. This divergence is similar to ex-partners pursuing their individual interests within a shared home, leading to tensions and competitive dynamics. Yet, even in this competitive atmosphere, there is a need for coordination to manage the shared spaces – highlighting how trade and scientific collaboration require both parties to remain aware of and responsive to each other's regulatory changes.

Amidst the mutualistic and competitive co-evolutionary patterns observed in the study, a power asymmetry skews in favour of the EU, particularly in the case of food safety, where the UK's adaptive responses have been more significant than those of the EU. This power imbalance in the co-evolutionary process suggests that while mutualistic interactions can occur, they are often tinged with competitive elements, as each entity seeks to assert its influence and protect its interests. Like ex-partners sharing a roof where one holds more sway, the UK often finds itself making more adjustments to maintain harmony and access to the EU market. These dynamics underscore the complexities of their post-divorce relationship, where cooperation is necessary, but power struggles are inevitable.

Ultimately, the EU and UK's post-Brexit regulatory relationship is characterised by a dynamic equilibrium, where the forces of cooperation and competition coexist and continually shape the evolution of their respective regulatory frameworks. This equilibrium is not static but will be redefined over time through a complex interplay of historical ties, strategic interests, and responses to a changing global environment.

## 8. Conclusion: the journey from marriage to cohabitation

The metaphor of transitioning from 'marriage to cohabitation' adeptly encapsulates the evolution of the EU-UK relationship. In their 'marital' phase within the EU, the processes of Europeanisation facilitated a deep regulatory alignment and shared governance, like the shared life of a married couple. However, Brexit has not rendered the UK a mere acquaintance to the EU, subject solely to the external influence described by the Brussels Effect. Instead, their long-standing history, combined with ongoing negotiations and agreements, have established a new paradigm of interaction – one characterised by co-evolution.

This co-evolutionary narrative acknowledges that, despite the cessation of the formal mechanisms of Europeanisation – the 'uploading' and 'downloading' of rules and norms – the UK and the EU cannot simply revert to distant entities, unaffected by each other's decisions. Their shared past and the intricate web of economic, social, and political ties demand a continued engagement, although under a new guise. This relationship now unfolds within a framework that allows for competitive, mutualistic, or parallel outcomes, reflecting the varied nature of their post-Brexit interactions.

In the case of food safety, we observed a predominantly mutualistic pathway where high standards, rooted in past crises, have been maintained. This reflects a shared commitment to public health and safety, underscoring the enduring impact of their collective history and the ongoing necessity for cooperation in regulation. The agreement on maintaining tariff-free trade and establishment of SPS committee in the TCA further exemplifies this mutualistic adaptation, ensuring that despite the end of formal Europeanisation processes, the relationship continues to evolve in a way that benefits both parties.

Conversely, the regulatory dynamics surrounding gene editing illustrate a more competitive trajectory, where the UK's departure from the EU has emboldened it to pursue a more liberal regulatory framework. This divergence signifies a strategic attempt by the UK to leverage its regulatory autonomy to foster innovation, challenging the EU to reconsider its own regulatory stance. Such competitive adaptation reveals the limitations of the Brussels Effect in accounting for the reciprocal nature of influence, as both entities continue to respond and adjust to each other's regulatory changes despite the apparent power differentials.

Co-evolutionary theory, therefore, not only captures the essence of the post-Brexit regulatory relationship between the EU and the UK but also enriches our understanding of how these entities can navigate their shared space. It demonstrates that their relationship is not defined by a one-way street of influence or a quest for uniformity but is a complex interplay of adaptation, where history, shared challenges, and future aspirations intersect. The theory offers a more nuanced and realistic portrayal of the EU-UK dynamic, acknowledging that while the formal channels of Europeanisation may have ceased, the shared regulatory 'house' they continue to cohabit necessitates ongoing negotiation, adaptation, and sometimes, competition.

In conclusion, this analysis has unveiled the nuanced reality of EU-UK regulatory relations, marked by a continuous process of adaptation and influence. This approach does not see divergence as merely a departure from uniformity but as an opportunity for both entities to evolve in ways that reflect their unique circumstances and ambitions. In this landscape, both entities continue to navigate their shared and separate paths, influenced by each other and by the broader global political economy. The post-Brexit era, therefore, is not an endpoint but a new chapter in the co-evolutionary story of the EU and the UK, reflecting the complexities and opportunities of their unique relationship.

## Acknowledgments

I gratefully acknowledge the support of my PhD supervisors, Professor James Wilsdon, Professor Charlotte Burns and Dr Ruth Little, for their invaluable guidance and support throughout my PhD. I am also thankful to the Grantham Centre for Sustainable Futures for the financial support for the duration of my PhD. Without the support of these individuals and organisation, this article would not have been possible.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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