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Heyes, G, Thomas, C, Hooper, P and Urquhart, C (2020) The implications of sustainable development for airport duty-free business models. Journal of Airport Management, 14 (1). pp. 67-80. ISSN 1750-1938

**Publisher:** Henry Stewart Publications

**Version:** Accepted Version

**Downloaded from:** https://e-space.mmu.ac.uk/625415/

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**The implications of sustainable development for airport duty-free business models**

Received (in revised form): 22nd March, 2019

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**Abstract**

*This paper considers how the challenges underpinning sustainable development are likely to impact on duty- and tax-free retailing in airports and, by implication, in the entire aviation industry. The paper defines the role of retail as a vital source of airport revenues, before considering the carbon consequences of the sector's incumbent business models. It finds that products taken onto aircraft increase aircraft weight and fuel burn and are a primary source of carbon emissions for duty-free retailers. The implications for the sector are discussed, and the potential for implementing more sustainable business models is presented. Here it is identified that the specific logistical, economic, and political constraints of operating in the airport make alternative business models difficult, if not impossible to implement. The specialisations that have helped this sector to flourish are constraining their ability to adapt to the climate challenge.*

**Keywords**

*airport retail, airline fuel consumption, climate change, duty-free, sustainable development, sustainable business models*

**INTRODUCTION**

Retailing has played an essential role in shaping modern society. It drives economies and defines the nature of high streets and cities across the world. It is the mechanism through which consumption has thrived and,

through marketing and public relations, has shaped the very psyche of the public — shifting us from a needs to a wants culture.[1] Our addiction to consumption is, however, directly at odds with a planet of finite resources, with the carbon emissions and waste produced through the linear economy[2] lying at the heart of issues such as peak oil and climate change.

A particularly profitable form of retailing is that of duty- and tax-free retailing in airports (hereafter referred to as duty-free). Duty-free goods can be defined as goods purchased free of duties and import tariffs at the point where people depart a country, as the goods may not be consumed in the country where they are purchased.[3] From the first store at Shannon Airport in 1947, the sector has evolved from an ancillary activity (provided as a service for the benefit of passengers) to become a mature, profitable and essential part of the airport ecosystem.[4] As such, it can be seen to make an indirect contribution to facilitating the many socioeconomic benefits[5] provided by air transport.

The sector is a key source of revenue for airport operators. For instance, Heathrow Airport generated an income through retailing of some £612m in 2016 (Heathrow Limited, 2016). Globally, the retail concessions market makes up 26 per cent of all nonaeronautical airport revenues or approximately 10.3 per cent of all airport revenues.[6] The global duty-free retailing market is expected to be worth US$114.53bn by 2021.[7] This is due to access to a large, captive audience with a high propensity to spend, a large amount of 'dwell' time and perceived low prices due to duty and tax exemptions.[8–13] Indeed, for the travelling public, duty-free can be considered synonymous with the flying experience,[14] and alongside essential passenger and air traffic handling services, commercial operations are today one of the primary activities that occur in the airport.[15]

Such is the significance of these revenues that airport retail has the ability to have a marked impact on an airport's internal infrastructure and operations. In addition to the significant proportion of space given over in terminals to retail outlets, passengers at many airports are required to pass through a duty-free outlet in order to reach the departure gate. This routing of passengers illustrates how important the commercial imperative has become — no stone is left unturned in the pursuit of sales.

While the airport retail sector is expected to continue growing, the literature identifies a number of external risks. These range from the growth of online retailing to changing demographics; a poorer middle class and the growth of low-cost carriers, which typically attract passengers who spend less in the airport.[16–18] A further risk, not yet highlighted in the academic literature, is that of climate change and the associated environmental, economic and political implications for different stakeholders within the aviation industry. Climate change

poses a significant risk to all organisations; duty-free retail, however, faces the additional challenge of being based in a wider industry that is under increasing pressure as a result of its contribution to climate change. Indeed, there are already calls for the aviation sector to address the carbon consequences of its operations.[19] Additionally, products sold by duty-free retailers generally result in additional emissions compared to those sold on the high street, as the weight of duty-free items taken onto aircraft by passengers can impact an aircraft's fuel burn and emissions.[20] Gosling,[21] for example, identified that transporting a bottle of wine onboard a Boeing 747-400 over 7,000 km will increase aircraft $CO_2$ emissions by roughly half the bottle's weight. Considering the volume of products sold by airport duty-free retailers, the potential carbon consequence of this could be significant. To date, however, there has been little research into the contribution of duty-free retail to the air transport industry's carbon emissions and of the ability of these retailers to adopt new ways of doing business that might reduce such emissions. This is a notable gap in the research considering the popularity of duty-free retailing by airport users, the rising cost of aviation fuels and the increasing importance of retailing revenues to airport operators.

The development of airport retailing over the past 60 years has seen it have the potential to impact the business models of both airports (through increased nonaeronautical revenues) and airlines (through both increased nonaeronautical revenues and increased fuel costs). The future development of the sector is therefore of great importance to the entire aviation industry. Accordingly, this paper looks to first identify the current situation airport retailers find themselves in with regards to the issues surrounding climate change (a situation analysis). It then investigates the ability of the sector to adapt to this challenge through new business model approaches (a solution analysis). This follows the approach advocated by Boardman, Shapiro and Vining[22] in their comprehensive strategic analysis framework, as adapted and applied in a sustainability context by Heyes *et al*.[23] In so doing, the paper addresses the research question: How can airport retailers respond to climate change and what are the potential solutions? The overarching structure taken to the research is outlined in Figure 1.

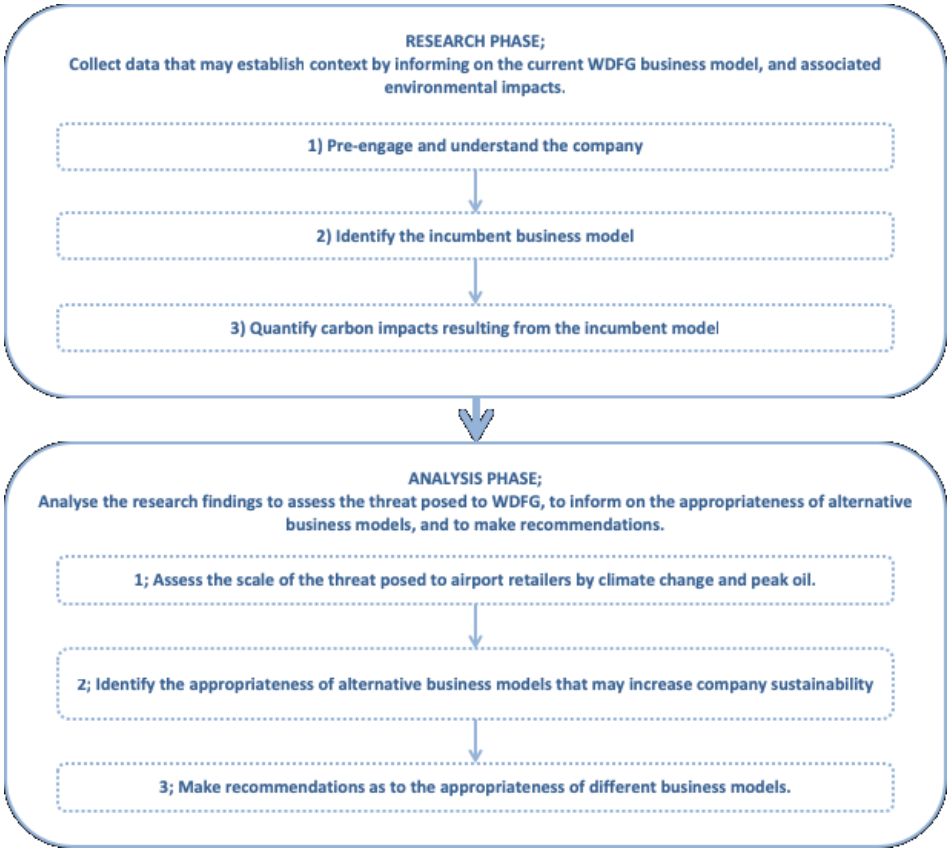



**Figure 1** The approach taken in conducting this research

**Note:** WDFG, World Duty Free Group.

Under 'Discussion: Implications for the duty-free sector', the paper identifies the implications of climate change for the industry from a political, economic and environmental perspective, with concluding remarks under 'Conclusions'.

## SITUATION ANALYSIS: DUTY-FREE RETAIL AND SUSTAINABLE DEVELOPMENT

Aviation has changed the world in which we live. It has provided high-speed mass transport over long distances, driven economic and social progress and connected people and cultures. It has created new patterns of trade and human migration, provided access to global markets, created the global tourism industry and employed millions of people. Some local and national economies are highly reliant upon air transport — for instance, in the United Kingdom the industry contributes around 960,000 jobs and generates some £52bn in gross domestic product.[24]

Such benefits are, however, not without cost. The consumption of natural resources (particularly carbon fuels) and the release of greenhouse gases that contribute to climate change are intrinsically tied to an industry that

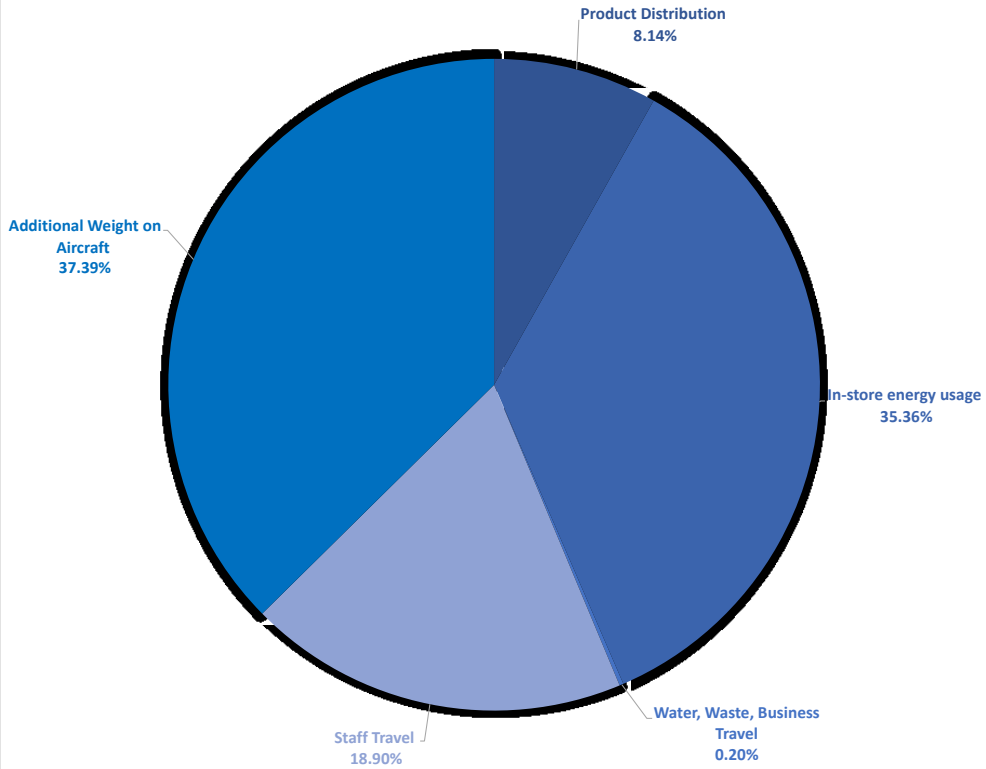
is reliant on the combustion of fossil fuels and the steps to technological change away from this reliance on fossil fuels is many decades away.[25]

Presently, aviation emissions contribute some 4.9 per cent of all anthropogenic radiative forcing globally, with carbon dioxide ($CO_2$) from aviation accounting for 5.3 per cent of greenhouse gas emissions in 2013 in the United Kingdom (UK).[26] Growth has, however, outstripped technological and operational improvements and will continue to do so.[27] The result will be an economically, environmentally and politically unsustainable future, where increased fuel consumption and carbon emissions from aviation could become one of the primary sources of climate change due to human activities. This is of concern to governments that have set stringent targets in response to climate change — notably, the 2016 Paris Agreement to limit climate change to no more than 1.5 degrees.[28] Targets too have been set for aviation, not least to achieve a 50 per cent reduction in net aviation $CO_2$ emissions by 2050 relative to 2005 levels.[29]

Considering the scale of these commitments and that it has been predicted that they can only be achieved with a heavy reliance on carbon offsetting,[30] it is clear that every stakeholder in the aviation industry will be required to contribute to a reduction in the industry's carbon emissions. Failure of the industry to do so will see pressure build — for instance, via legislation,[31] market-based measures and other commercial pressures on airlines and airports[32,33] or via activism from an increasingly informed public.[34] Indeed, environmental issues (predominantly, noise, local air pollution and climate change) are already constraining some airports — for instance, at Stockholm Arlanda, a carbon cap ensures that overall $CO_2$ emissions arising from the operation of the airport must total no more than those produced in 1990.[35]

It is in this context that the airport duty-free sector must address the full carbon implications of its operations. Such retailers face the same risks and challenges from climate change as high-street retailers — for example, resource scarcity resulting in products becoming unavailable or subject to price increases.[36] Likewise, rising energy and utility costs pose a threat to all retailer bottom lines.[37] To explore the climate change implications for, and potential responses by, the retail sector in more detail, a case study of a leading duty-free retailer was carried out by researchers from Manchester Metropolitan University.[38] It did this through the application of a strategic analysis driven by a detailed carbon account of the company's primary downstream scope 1, 2 and 3 activities, as defined by the greenhouse gas (GHG) Protocol.[39] This carbon account provided a valuable context for a discussion on the significance of the scale of these emissions and the threat posed to the company's

business model. The research calculated that 31 per cent of the company's carbon emissions resulting from activities conducted by the retailer at the airport resulted from energy usage in their stores (See Figure 2).




**<FN>Figure 2** <FC>Illustrating the different sources of emissions as a percentage of emissions produced by the case study retailer at a large hub airport

Comparing such emissions to the total energy-derived emissions claimed by the airport operator suggested that energy usage by the case retailer accounts for approximately 7 per cent of the entire airport's energy demands. For a single company operating just three primary outlets in the airport, this is not an insignificant amount. Conversely, if one considers that retailing is a primary source of revenue for airports, then it could be argued that such emissions are warranted. Moreover, there is evidence that the studied retailer is already using carbon reduction initiatives comparable to an award-winning carbon management programme of a high-street retailer.[40]

The most significant finding from the research was the scale of indirect scope 3 emissions that arise due to company activity — particularly emissions emitted by aircraft as a result of carrying additional weight in the form of products sold by the retailer (thus, increasing fuel burn). Such emissions were the company's single greatest downstream source of carbon, accounting for 37 per cent of the retailer's total annual emissions associated with airport activity. As downstream indirect emissions, these are not directly produced by the

retailer, but they exist as a direct result of the retailer's business model. Moreover, the company is in a position to monitor and directly influence these emissions. Best practice in the carbon accounting literature suggests that such emissions should be included in the retailer's carbon accounting.[41]

The implications of this could be significant. Airlines are looking for increasingly innovative ways to reduce aircraft weight — for example, through the use of lighter catering trolleys, cutlery, seats, unpainted airframes, reductions in in-flight entertainment and even the removal of life safety vests for overland flights.[42] As fuel prices rise and climate change concerns grow and in the context of airlines being unable to deliver carbon reduction targets — as is presently forecast[43] — aircraft operators could begin to focus on reducing weight arising from the sale of goods at airport retail outlets. Indeed, airlines have previously attempted to influence weight taken onto aircraft by passengers through the (now overturned) 'one-bag rule', which limited hand baggage and had significant negative impact on duty-free sales at airports.[44]

When the case study findings were extrapolated to a global level, these emissions were found to potentially contribute 0.03 per cent additional fuel burn by aircraft each year. This equates to an additional 0.03 per cent in fuel costs for airlines (£41m) and 0.03 per cent (238,220 t $CO_2e$) in carbon dioxide emissions. Although small percentage contributions, against the background of a growing industry with limited efficiency improvements available for aircraft, the benefits of reducing such emissions have clear value. This can be put into context by the fact that the analysis found that on routes exhibiting the greatest retail sales, the potential weight saving by removing duty-free products from aircraft was over 80 kg per flight. This surpasses many of the weight savings implemented by airlines through existing measures. For example, Air Canada Jazz removed safety vests from aircraft not travelling over water at a combined weight saving per aircraft of just 23 kg.[45]

Considering airlines are already implementing significant measures for comparably marginal weight savings, the continued presence of airport duty-free could be called into question. In future, governments seeking to reduce carbon emissions and NGOs opposed to aviation growth may argue that airport duty-free retail does not directly facilitate global mobility, yet it has direct consequences for aircraft emissions. Such calls may not arise, but in the interests of managing down risk, the retail industry needs to be aware of the carbon implications of its operations and take measures as necessary to find new ways of operating that are commercially sustainable (for them to be accepted by the industry), operationally deliverable (to fit within the specific operational constraints of the airport), while also being environmentally appropriate for the low-

carbon society required to avoid the catastrophic effects of climate change, as outlined by the United Nations Paris Agreement.

**SOLUTION ANALYSIS: THE POTENTIAL FOR LOW-CARBON BUSINESS MODEL IMPLEMENTATION**

Business models, as defined by Osterwalder and Pigneur,[46] are 'the rationale of how a firm creates, delivers and captures value', and offer a useful lens through which one can determine how a business can generate revenue in a given scenario. Doing so in an environmental context is important, as 'sustainable solutions to sustainable development problems will [. . .] require sustainability-oriented business models'.[47] Sustainable business models provide the link between sustainable innovation and economic performance and at higher system levels[48] act as a framework to understand how and what a business does while providing a structured way for sustainable business thinking to take place.[49] Bocken *et al.*[50] identify eight sustainable business model archetypes:

- Maximise material use and energy efficiency.
- Create value from waste.
- Substitute with renewables and natural processes.
- Deliver functionality rather than ownership.
- Adopt a stewardship role.
- Encourage sufficiency.
- Repurpose for society/environment.
- Deliver scale-up solutions.

Each of these archetypes are rooted in three broad categories identified by Boons and Lüdeke-Freund[51] as being technological, social or organisational in nature. Implementing Bocken *et al.*'s archetypes can provide significant opportunities for firms: from minimising risks to delivering resource efficiencies and creating and gaining competitive advantage in new markets. They help to overcome barriers to sustainability by identifying mechanisms that may capture wider benefits for consumers or by finding new ways to define additional costs incurred. For example, efficient technologies, such as low-energy light bulbs, are often promoted to the public

on the grounds of reduced costs rather than on environmental savings, despite often requiring a greater initial investment.

These archetypes were used to guide the identification of sustainable innovation opportunities for the case study retailer, in terms of addressing its most significant sources of carbon — direct emissions from energy usage and indirect emissions produced by aircraft as a result of having to transport products sold by the company.

The analysis found limited opportunities for any radical innovations that could be implemented by the case study retailer. The logistical constraints of operating in an airport (limited space, security challenges, infrequency of passenger visits) made many of the archetypes simply infeasible for implementation in this specific setting. At the same time, some innovations, although logistically feasible, were not found to be economically appropriate for the sector, considering the importance of duty-free retail revenues to the aviation industry and their likelihood of adoption by company shareholders or their potential buy-in by airport operators. The very factors that have helped the industry to become so popular now, in essence, appear to be constraining its ability to adapt and innovate in the same way as other retailers found on the high street. For instance, online delivery of products could potentially see items sold in an airport but delivered to residences; the business model analysis, however, identified that this would be unlikely to be as popular, and thus profitable, as the existing business model. Additionally, it would require lobbying against existing policy regarding the sale of duty-free products, which currently prohibits duty-free items from being delivered in this way. Moreover, the case firm in the study stressed that they believed that such an approach would encourage other retailers to enter the duty-free market by claiming that online delivery has blurred the lines between duty-free and other forms of retailing.

That said, some potential opportunities and recommendations were identified. The sustainable archetype offering most hope to the industry was maximising material resource use and energy efficiency. This essentially regards the potential for retailers to do business activity with fewer resources and by generating less waste, emissions and pollution.[52–55] This approach is appealing to retailers, as it largely facilitates a business-as-usual approach and accomplishes sustainability through efficiencies. As such, it avoids the risks of radical innovation away from existing tried, tested and profitable business models. Innovations under this archetype include first order principles of sustainability, such as enhanced energy saving in stores; they, however, could also include reducing the amount of materials in the products sold — for instance, by reducing

packaging. This would also reduce the amount of weight taken onto aircraft. It would, however, would be difficult to implement, as it would require joint initiatives with many thousands of suppliers who would each have to modify their own supply chains and manufacturing processes in response. Changing to lighter-weight packaging (eg glass rather than plastic packaging of bottles containing alcohol) would also clash with the company's value proposition of luxury — something that the business model analysis identified as an essential driver behind the sector's economic success. The dematerialisation of products could also reduce weight taken onto aircraft (ie by selling digital rather than physical magazines or books); consumers, however, can already do this through established digital media providers.

The most radical innovation that holds potential for the sector is delivering functionality rather than ownership — that is, selling services rather than the permanent sale of physical products. This is unlikely to be implementable as the main way in which retailers generate revenue; it could, however, become a large and potentially profitable 'bolt-on' to the incumbent business model. For instance, retailers could lease low-weight but expensive items such as jewellery that could generate revenue at least-added weight rather than the sell lower cost and heavy items such as alcohol (which need to be sold in a higher volume and at a significantly higher weight burden for aircraft). Doing so could open access to a new range of customers who lack the affluence to purchase such expensive items but who may be willing to pay for them on a lease or subscription service for the duration of a leisure or business trip. If implemented correctly, this could lead to a reduction in weight sold by the airport while also introducing a new revenue stream into the business.

Switching to renewable energy providers (or generating their own energy off site) could represent a way for retailers to reduce their direct carbon emissions from airport activity while maintaining their existing business model; this, however, would not address the additional emissions of products being taken onto aircraft.

Upgrading the company's vehicle fleet to electric vehicles could also reduce the organisation's emissions; the case firm, however, was already identified as having a cutting-edge and sustainably powered fleet.

Duty-free retailers could engage with their entire supply chains, not just for lighter packaging but also for implementing sustainability principles in their own organisations, and only choosing suppliers who comply with certain standards. A similar approach is taken by many retailers in other sectors. For duty-free retailers, this could take the form of upstream and downstream engagement:

- Upstream retailers could engage with their suppliers to drive more ethical or sustainable business practices through the supply chain, particularly in ways that benefit its own business — namely, by reducing the weight or nature of materials used in product packaging.
- Downstream retailers could proactively engage with passengers to encourage the use of collection on arrival services (that would reduce the mass of weight taken onto aircraft) or to promote the purchase of carbon offsets (discussed below) to mitigate the weight of products taken onto aircraft.

**DISCUSSION: IMPLICATIONS FOR THE DUTY-FREE SECTOR**

The results of this research suggest that the increasing pressures upon the air transport sector on climate change could present a genuine threat to current business models operated by the airport retail sector. It seems likely that the sector will continue to play an important role in the services offered to passengers at airports in the short to medium term; in the longer term, however, current business models may potentially become unsustainable.

All business activity is associated with some environmental impact; compared to their peers outside the airport setting, however, duty-free retailers are faced with two challenges. First, they operate within a sector that faces significant scrutiny due to its climate change emissions. Secondly, their operations directly result in additional environmental impacts that typical high-street retail does not — increased fuel use and emissions from aircraft. Furthermore, comparatively little is being done (by retailers or other aviation stakeholders) to address these impacts.

Duty-free retailers have been highly successful because they have specialised in generating revenue in a very specific setting (the airport), with very specific demands (physical, legal, commercial). It is this very specialisation, however, that is impeding the case firm's potential to adapt to a low-carbon society and to develop low-carbon business models appropriate for such a society. In the short term, such emissions are proving little threat to the sector; as aviation grows, however, to become one of the greatest single emissions-producing industries, this may change — particularly, in light of the additional financial costs to airlines and the weight-saving initiatives already undertaken by airlines and aircraft manufacturers.

Adaptation will prove difficult. While airport duty–free retailers will find it easy to develop world-class carbon management systems for the direct impacts of their operations (indeed, many already do), a number of barriers constrain the potential for radically different sustainable innovations.

Application of the sustainable business model archetypes of Bocken *et al*. within the CSA framework was unable to find solutions to this challenge. For instance, they

- were not compliant with the physical and regulatory constraints of the airport;
- would not generate the same revenues as existing business models;
- run contrary to current customer demands and the demands of brand suppliers and
- do not tackle the most pressing environmental issues that threaten retailers or the wider aviation sector — the impact of products being taken onto aircraft.

The failure to identify sustainable business models or interventions should not be seen as a critique of Bocken *et al*.'s archetypes or the desire of the duty-free sector to adapt to a changing world. Rather, it is an acknowledgment that the specific setting of aviation retail and the existing legislative and political landscape makes adaptation difficult. The archetypes provide us with different sustainable models, which in practice, can be blended and adopted incrementally, rather than being adopted as wholesale changes to a company's business that may be difficult to advocate to shareholders.

It is in the best interest of airport duty- and tax-free retailers to actively reduce the emissions of all of their activities and to do so holistically by engaging with the entire aviation sector rather than trying to find solutions alone. Taking leadership in this way will ensure that the sector is in a position to have full control over its future and not be at the behest of other sectors who may develop solutions that are not in the best interests of incumbent retailers. For instance, policy changes that would allow products to be sold online and delivered to people's houses rather than being taken onto an aircraft could enable companies such as Amazon to provide duty-free services in airports, facilitated by an already extensive infrastructure to provide such services.

**CONCLUSIONS**

This paper looked to assess the future of the airport duty- and tax-free retail sector through the lens of climate change, in the context of the increasing calls for the air transport industry to reduce the carbon impact of its operations. The past 60 years have seen duty-free retailing transform from an ancillary service offered to passengers to a key revenue driver for airports and airlines. At the same time, it has grown to represent a sizeable cost for airlines in terms of increased fuel burn as well as represent a sizeable proportion of airport

energy use. In the context of wider industry pressure and existing interventions to reduce aircraft weight, this suggests that retailers could eventually come under pressure from calls to reduce the carbon impact of their operations.

The wider literature on the debate surrounding sustainable business has made it clear that it is not a question of if businesses will need to act on climate change but of when and to what extent. Action needs to occur soon and will require different business models to those that have been dominant since the end of the Second World War. Businesses can choose to adapt voluntarily, or they will be forced to do so by the environmental and societal impacts of climate change and subsequent political and economic responses.

The continuing growth of air transport, coupled with limited opportunities for technologically sustainable innovations, means that it is expected to become one of the primary sources of global carbon emissions in the future. This suggests that while aviation and retail are both popular with the public, and important for global economies, they will eventually come under increasing scrutiny. As a subsector of air transport, duty-free retailers may be protected from the environmental pressures faced by aviation in the short term. Should such pressures transfer onto the sector, however, retailers will be required to demonstrate that they have taken every effort to minimise the environmental implications of their operations. In so doing, they will maintain their social licence to operate with the public and justify their continued importance to the industry. The question that duty-free retailers must ask is how they will implement sustainability in their organisations. Will they adapt in the immediacy, taking on some short-term risk but on their own terms? Or will they be reactive and at the behest of other actors who may impose or change legislation at short notice?

The world has changed considerably since the opening of the first duty-free store in 1947, and the sector has risen to become a key part of the aviation system. The business models underpinning the sector have, however, largely stayed the same. Although a more sophisticated and complex business, airport retail is still broadly rooted in the permanent sale of the same product categories, with added value propositions provided through luxury and quality branding.

The question must be asked as to whether this business model is still appropriate for a low-carbon and zero-waste society. The solutions can range from the radical (seeking models that are not associated with consumption) to the incremental — for instance, shifting away from core product brands such as heavy alcohol products towards low-weight, high-value products such as jewellery — but the economic viability of such business models remain unknown. The industry should commence a full risk assessment to assess the

validity of the implementation of such models, considering the associated risks and the potential opportunities of such reconfigurations, to determine if the best course of action to ensure that this much loved, and important, industry can remain a part of the flying experience for many years to come.

At the same time, the industry needs to evaluate the position of duty-free in the industry. Are the carbon and fuel-burn implications of such an industry justified in the context of climate change? Or can they be seen as reasonable, considering that onboard duty-free as sold by airlines is likely to carry a much greater carbon cost, particularly when the weight of onboard shopping and catering carts are taken into consideration?

**ACKNOWLEDGMENTS**

The authors would like to acknowledge the participating leading duty-free retailer who represented the case firm in this study and who offered data and kind support throughout the research process.

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