The Promise of the Aerotropolis Model in the United Arab Emirates: The Role of Spatial Proximity and Global Connectivity

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This article investigates whether the region surrounding Dubai International Airport in the United Arab Emirates (UAE) replicates the theoretical postulations of the aerotropolis model developed by Kasarda. Kasarda has argued achieving an effective aerotropolis requires situating companies close to the airport based on their frequency of use in order to lower transactional costs. Based on self-administered questionnaires distributed to 306 cargo-related businesses, a Spearman rank correlation coefficient of 0.56 (p = 0.000) suggests a positive and moderate association between a firm’s travel time to Dubai airport and the frequency of its use of airport facilities. About 76% of businesses surveyed were located within <30 minutes’ drive of Dubai Airport and reported shipping either daily or weekly through the airport. Such clusters of airport-oriented activities around the airport provide further insight into the detailed spatial organization of the aerotropolis urban form. Findings suggest that two different forms of aerotropolis have emerged in the UAE: Abu Dhabi and Dubai Airports appear to have had a more conventional urban evolution, while Al Maktoum Airport has been explicitly developed based on an “ideally planned” aerotropolis vision in a largely peripheral setting to accommodate the Dubai World Central megaproject.

Keywords: aerotropolis, air transportation, airport, Dubai, land use

Cet article cherche à savoir si la région entourant l’aéroport international de Dubai dans les Émirats Arabes Unis (EAU) reproduit les postulats théoriques du modèle des aérotropolis développé par Kasarda. Kasarda a soutenu qu’une aérotropolis efficace exige de placer les entreprises à proximité d’un aéroport en fonction de leur fréquence d’utilisation pour limiter les coûts de transaction. Sur la base des données recueillies par questionnaire auprès de 306 entreprises liées au transport de marchandises, une corrélation de 0.56 (p = 0.000) suggère une association positive et modérée entre le temps de trajet d’un établissement à l’aéroport de Dubaï et la fréquence de son utilisation des installations aéroportuaires. Plus de 76% des entreprises interrogées se trouvaient dans un rayon de moins de 30 minutes de trajet de l’aéroport de Dubaï et déclaraient expédier soit quotidiennement soit à la semaine par l’aéroport. Ces clusters d’activités orientées vers l’aéroport apportent une perspective supplémentaire sur la spatialisation détaillée de la forme urbaine de l’aérotropolis. Les résultats suggèrent que deux formes distinctes de aérotropolis ont émergé en Émirats Arabes Unis : à Dubaï et Abu Dhabi, où l’aérotropolis s’est développée de manière plus conventionnelle, tandis qu’à Al Maktoum, l’aérotropolis a été explicitement développée dans un contexte périphérique, en vue de recevoir le projet de mégaprojet Dubai World Central.
de questionnaires auto-administrés distribués à 306 entreprises du secteur du fret, un coefficient de corrélation de Spearman de 0,56 (p = 0,000) suggère un lien positif et modéré entre le temps mis pour atteindre l’aéroport de Dubaï et la fréquence d’utilisation des installations aéroportuaires. Environ 76% des entreprises interrogées sont situées à moins de 30 minutes de l’aéroport de Dubaï et l’utilisent pour des mouvements de biens quotidiens et hebdomadaires. Ces clusters d’entreprises situées autour de l’aéroport et liées au transport aérien, apportent un éclairage complémentaire sur l’organisation spatiale détaillée de la forme urbaine des aérotropolis. Les résultats suggèrent que deux formes différentes d’aérotropolis ont émergé dans les Émirats Arabes Unis : les aéroports d’Abou Dhabi et de Dubaï semblent avoir eu une évolution urbaine plus classique, alors que l’aéroport Al Maktoum a été explicitement développé à partir d’une aérotropolis « idéale », dans un cadre périphérique afin d’accueillir le mégaprojet de Dubai World Central.

Mots-clés: aérotropolis, transport aérien, aéroport de Dubaï, utilisation des sols

Introduction

A growing literature has emerged highlighting the substantive socio-economic impact of airports and air transport in regional economies (Kasarda 2000, 2008; Al Chalabi and Kasarda 2004; Graham 2008; Schaufsma 2008; Dobruszkes et al. 2011; Kasarda and Lindsay 2011). Seeking to benefit from the wide range of flight destinations and high-quality services available in airport regions, companies (especially those that ship high-value, low-weight products) have increasingly sought out locations closer to airports. Kasarda has argued that a new form of urban development, which he terms the “aerotropolis,” has emerged in recent years. Examples include areas around major international gateways such Hong Kong International Airport, Amsterdam Schiphol Airport, and Incheon International Airport in South Korea. According to Kasarda, an aerotropolis is essentially an airport-integrated region extending as far as 32 km (20 miles) from the inner core area of hotels, offices, and distribution and logistics facilities.

The enormous investments required to establish an aerotropolis have been affected in recent years by the credit crunch, the global economic slowdown of late 2008 and 2009, “Arab Spring” disruptions, and a general rise in jet-fuel prices. But Kasarda (2009, 60) has argued that, despite these challenges, “commercial aviation in time will rebound strongly and continue to drive economic development.” The globalized economy, the growth of services and the tourism industry, and the need for face-to-face contact and speed of delivery will continue to increase the significance of air transport in reshaping urban infrastructure and boost regional economies “on the ground.” This claim holds true particularly in the Asia/Pacific and Middle East regions (Debbage and Alkaabi 2008;

Despite increased attention to the impact of expanding air-transport hubs within urban regions, few studies have addressed this issue in the Middle East, where the air industries (airport, airline, and related industries) are rapidly expanding, along with major non-transport-specific economic activity. The United Arab Emirates (UAE), for instance, has continued to exploit its strategic geographic location linking Europe and Asia, which has enabled its major airports to sustain market power in recent years. In 2010, about 1.1 million jobs in the Middle East were attributable to the air-transport industry, which contributed almost US$76 billion to Middle Eastern GDP (Air Transport Action Group 2012).

The UAE offers an excellent test case for evaluating the aerotropolis model. Leveraging substantial capital growth generated primarily by oil revenues starting in the 1960s, emirates such as Abu Dhabi and Dubai have made an international name for themselves through huge investments in recent decades. They have evolved more diversified economies reliant on international tourism, trade, and business (Wilson 2010). Abu Dhabi and Dubai, in particular, have continued to recognize the importance of airports as key generators of economic activities and as magnets for wider economic and industrial opportunities in the surrounding areas (Kasarda and Lindsay 2011). Their commitment to their own aviation-based industries comes through in their aggressive development of national flag carriers—Etihad and Emirates Airlines, respectively. They have also significantly expanded their respective airport capacities (Abu Dhabi International Airport and Dubai International Airport). In addition, both emirates have been heavily involved in planning and developing the urban regional spaces around these airport locations.

Granted, recent financial woes have forced Dubai to scale down some of its larger development commitments, including a proposed real-estate project known as “The World,” an artificial archipelago shaped roughly like a world map (Bloch 2010). But the negative effects have by no means stopped the UAE’s huge investments in its economy. Middle East passenger traffic, as measured by revenue passenger-kilometres, is projected to increase by 6.4 % from 2011 to 2031, compared with only 2.8 % growth for North America (Boeing 2012b).

To begin to remedy the general neglect of the Middle East in the academic literature on the aerotropolis phenomenon, this article investigates how well the three largest airports in the UAE—Abu Dhabi Airport, Al Maktoum Airport, and Dubai International Airport—replicate Kasardas’s aerotropolis model. Drawing on survey data and on print and online sources, we focus specifically on growth patterns, related land use, and the role of spatial proximity to the airport. The relative importance of
various attributes of the aerotropolis is gauged by analyzing data taken from surveys of businesses in the region. We hope to contribute to an improved theoretical understanding of the aerotropolis concept in a non-Western context and to add to the existing literature on air transport and urban geography as well as to Middle Eastern studies.

**Theoretical Context of the Aerotropolis Model**

Economists, geographers, and other scholars have acknowledged the important role of air transport in shaping urban economies (Robertson 1995; Button and Taylor 2000; Debbage and Delk 2001; Brueckner 2003; Kasarda and Green 2005; Alkaabi and Debbage 2007; Chang and Chang 2009; Donzelli 2010; Marazzo et al. 2010; Alkaabi and Debbage 2011). The advent of the service and global economy has highlighted the importance of speed and flexibility in the product-delivery process as a key to competitive success. This applies especially to high-value, low-weight products, and the trend is expected to grow. Global air cargo traffic is projected to increase by an average 5.2% per year, from 202.4 billion revenue tonne-kilometres (RTK) in 2011 to above 558.3 billion RTKs by 2031 (Boeing 2012b, 3). A range of logistics and aviation-related companies and businesses with a high propensity to ship by air have increasingly tended to cluster around airports and airport corridors to take advantage of the elevated access to airport facilities and related cargo traffic. This in turn has fostered the growth of residential, medical, entertainment, and other facilities. Thus, airports have become a focal point for business activities and an economic engine for certain regions. With the increased recognition of air transport’s significance, several theoretical conceptualizations have emerged to better understand airport-related activities and aviation-driven development around an airport based on the scale and type of businesses.

Typologies of development include the airfront, the airport city, the airport metropolis, and the aerotropolis, which differ by scale and functionality. Blanton (2004) defines an airfront as a district representing a collection of aviation-related industries and services situated at a local scale adjacent to an airport. On a larger scale, Schaafsma (2008) has described the airport city as an urban development that takes place in the centre of the airport and consists of the integrated development of the airport and the related real estate handled by the airport authority. This is accompanied by airport corridors extending to a regional scale between the airport and the city proper. In the airport city model, integrated development of real estate (e.g., office parks, technology parks, trade marts, conference centres, shopping centres, leisure parks, and hotels) and road/rail infrastructure is coordinated by developers (Schaafsma 2008).
The nature and success of these models depend on the socio-economic status of the area adjacent to the airport, airport ownership patterns, location relative to the city, type of infrastructure networks, and various government planning policies (Schaafsma 2008).

Stevens et al. (2010) have recently suggested the “airport metropolis interface model” to describe various Australian airport roles in the regional economy. They argue that the focus should be on the synergistic union of core airport activities and airport-oriented developments on a broader regional scale. This involves a more coordinated focus on economic development issues, land-use policies, infrastructural provision, and governance matters.

Kasarda (2008) developed the more comprehensive “aerotropolis” concept to describe the critical impact of airport and aviation-related urban development on the geography of urban form. According to Kasarda (2008), the aerotropolis comprises an urban complex with the airport terminal at its core. In terms of spatial proximity, the airport city and the aerotropolis can be classified as “airside” (those within the airport perimeter proper); “landside” (land adjacent to this perimeter); and “extended” (those beyond landside, from within a few miles of the airport perimeter up to 24–32 km [15–20 miles] from the core; Kasarda 2000, 2001, 2008, 2009). The businesses occupying this layout, emanating outward from the core, are summarized as

(1) firms providing air transportation services, (2) firms which are frequent consumers of air transportation, (3) businesses which cater to the ancillary needs of air travelers and employees of the previous two types of firms, and (4) companies which may simply be searching for accommodating sites with good regional highway access (Kasarda 2010, 1).

A breakdown of these businesses generates quite a long and varied list: Kasarda lists about 20 categories for airside and landside alone.

The airside core businesses (airstrip and passenger terminal) include air cargo handlers, perishable food services, express couriers, mall-like terminal shopping amenities, and airport hotel/conference centres. Landside businesses also include not only transport-related logistics companies but also transport-consuming firms such as bonded (tax-free) warehouses, IT firms, and distribution centres. Serving employees in the vicinity and visitors are various entertainment and sports complexes and medical facilities. Various business parks, hotels, and other firms fill out the airport city / aerotropolis model as it develops along rail, highway, and other radiating corridors. As this complex, to use Kasarda’s characterization, becomes a “destination” in itself, the line between its transport and non-transport functions and participants blurs.
According to Kasarda, developments described by the aerotropolis model exist for some major gateways in Europe, North America, and particularly Asia, where many new airports are under construction or expanding (Schaafsma 2008; Vespermann et al. 2008; Kasarda 2009; Bowen 2010; Kasarda and Lindsay 2011). The Hong Kong International Airport (HKIA), with its innovative SkyCity—a large adjacent complex of business and entertainment activities—is a favourite example. Incheon International Airport in South Korea similarly consists of an International Business Center, an International Free Trade City, an Air City, and the New Songdo City, which all fit the aerotropolis logic.

Although some research has analyzed the business model of Emirates Airlines and its related role in developing and supporting Dubai’s emerging tourism industry (Debbage and Alkaabi 2008; Lohmann et al. 2009; O’Connell 2008; Surovitskikh and Lubbe 2008), the influence of air transport in shaping urban infrastructure projects around major Middle Eastern airports is still an understudied area that deserves further consideration. Existing studies have largely focused on the airline carrier’s role, service attributes, and market strategies in building the Dubai economy, rather than studying the land-use patterns and related industries that are emerging around each UAE airport.

The Middle East is one of the fastest-growing regions in the world in terms of passenger growth and airport development (Gittens 2012). The rapid and ongoing development in and around Middle-Eastern airports provides an opportunity to assess a fundamental assumption of the aerotropolis model. Kasarda (2008; Clapp 2012) has argued that companies that frequently ship by air will tend to be located closer to the airport in order to lower traffic congestion and enhance time-cost efficiencies. Therefore, we hypothesized that companies located closer to the UAE airports will tend to ship more cargo, place a higher premium on the services provided by the airport, and experience reduced transaction costs thanks to the reduced time in transit. The shape of existing and planned development also offers an opportunity to critically assess other claims made for the model, such as its presumed eco-friendly sustainability and its “trickle-down” benefits across socio-economic status, which are mostly beyond the scope of this paper but will be touched on briefly below.

This article should be considered a first step toward better understanding the impact of airports on shaping urban development patterns. Below we provide a more detailed articulation of the methodology used in this study.

Methodology and Data Sources

We first examine the relationship between a company’s frequency of shipping to Dubai International Airport and driving time to the airport. Using
SPSS version 17, we calculated a non-parametric Spearman’s rank correlation coefficient to measure the associational relationship between a firm’s frequency of air cargo shipment (daily, weekly, monthly, yearly) and the estimated travel time from the company location to the airport (<5 minutes, 5–10 minutes, 11–15 minutes, 16–20 minutes, 21–30 minutes, 31–50 minutes, 1 hour, 1.5 hour, >2 hours).

To collect the data, we distributed a self-administered questionnaire to a list of cargo-related businesses, including freight forwarders, logistics firms, and air carriers transporting general cargo and/or personal effects, obtained from the Dubai Civil Aviation Authority, Dubai Cargo Services, and Lifewealth Commercial Broker (LLC). The questionnaire, which consisted of 12 questions, was pretested with a sample of cargo companies (n = 20) to check the validity of the measures included. The questionnaire was first sent to company e-mail addresses; phone interviews were later conducted with company representatives or managers. Questionnaires were collected from March through July 2012. The final sample included 306 respondents, 247 (80.7%) of them located in Dubai, 40 (13.1%) in Abu Dhabi, 13 (4.2%) in Sharjah, 2 (0.7%) each in Fujairah and Ajman, and 1 (0.3%) each in Ras Al Khaimah and Al Ain (see Table 1).

Most of the companies surveyed (69%, n = 211) were located within 5 km (3 miles) of Dubai International Airport, and approximately 30% of those in the Dubai Cargo Village just west of the airport. The second-largest concentration of surveyed firms (8.2%, n = 25) was located in the Jabel Ali Free Zone (JAFZ), located more than 24 km (15 miles) south of Dubai International Airport.

This study also examines existing major land-use types within 5 and 24 km (3 and 15 miles) of Dubai International Airport to reveal similarities to and differences from Kasarda’s aerotropolis model. For this part of the study, we conducted multiple field visits to major nearby industrial areas (Um Ramool, Al Qusais district, Ras Al Khor industrial district, Al Quoz) to investigate the mix of industries they included. Because of the proximity of the Dubai Emirate to the neighbouring Ajman and Sharjah Emirates to the north, the spatial divisions of 5 km (<15 minutes’ travel time) and 25 km (<45 minutes’ travel time) clearly distinguish the influence of Dubai airport from the adjacent emirates.

Our analysis also extends to smaller nearby airports, such as Sharjah...
International Airport, located <16 km (<10 miles) north of the Dubai International Airport, which is the principal airport for the less well known Sharjah Emirate. Sharjah International Airport is the home base for the low-cost carrier Air Arabia, whose total passenger capacity is 8 million passengers per year.

We obtained data and GIS shapefiles for the Dubai International and Al Maktoum airports and related land uses from the Dubai Municipality (GIS Department), Dubai Airports Company, the Dubai Police Department, and Dubai World Central (Dubai Aviation City Corporation). Data and shapefiles for the Abu Dhabi International Airport and related urban development were collected from the Abu Dhabi Municipality (Department of Municipal Affairs) and the Abu Dhabi Urban Planning Council. Although these data provided a sound foundation for the analysis of the fundamental shape and form of the fledgeling aerotropolis geography in the Dubai airport region, more detailed data on floor space, vacancy rates, and client mix unfortunately are not publicly available.

Discussion and Results

Although UAE airports are often included in the list of aerotropolis examples, it is less clear whether these airports actually fit the theory in terms of the spatial geography of co-located firms and the key rationales and growth factors. Are firms merely locating in places that offer competitive land prices and good surface-transport-based connectivity and accessibility, or are transport-related industries clustering adjacent to major UAE airports to take advantage of air-transport links to more distant markets?

Dubai International Airport certainly fits the mould of an airport with very explicit airside and landside transport-related businesses (e.g., cargo handling, storage, and warehousing). In 2008, 2364 companies in Dubai were auxiliary transport or travel agencies, employing 61,836 workers (Dubai Statistics Center 2009). The airport is also surrounded by major industrial areas, including Umm Ramool and Ras Al Khor to the south and the Al Qusais industrial area to the immediate north, that contain numerous transport-consuming landside businesses (i.e., frequent consumers of transport-related services). A field visit to the Umm Ramool industrial area found a number of packaging industries (e.g., Gulf Packaging Industries, Arabia Packaging), logistics firms and warehouses (e.g., National Trading and Developing Establishment, Flomic Freight and Logistics, Dubai Duty Free Warehouse), and shipping companies (e.g., Speedex Courier and Cargo Modern Line Distribution LLC). In 2003, the Umm Ramool industrial zone had 460
companies employing 26,473 workers (Al-Qaydi and Brownson 2007). Similarly, the Al Qusais industrial zone is dominated by warehouses, advertising and printing businesses, shipping and forwarding companies, and, interestingly, a large number of auto shops. The auto shops are among the many firms that fit into the mould of general airport landside businesses (i.e., catering to the ancillary needs of travellers and local company employees).

The Ras Al Khor industrial zone, located within 24 km south of Dubai International Airport, is divided into three district areas. It largely specializes in auto-related services such as car auctions, car repair, and auto workshops, but a number of firms with cargo shipping-related services are also located there, including Great Waves Cargo Services, Date Quick Transport Services, and Four Way Cargo. Ras Al Khor is also home to Emirates Flight Catering, which supplies catering and supplementary services to airlines at the Dubai hub.

The Al Quoz industrial zone—located to the south-west of Dubai International Airport, equidistant between it and the new Al Maktoum Airport— is the biggest industrial zone in Dubai in terms of total area (1,838 ha) and is divided into four districts. Al Quoz hosts heavy and light manufacturing firms, construction companies, food-related companies, a number of clinical and testing laboratories, medical facilities, logistics and shipping firms, printing and publishing-related firms, and many product manufacturing industries.

Within 5 km of Dubai International Airport are substantial residential communities, including Al Twar and Al Qusais, to the north; Muhaisanah and Oud Al Muteena, to the east; and Al Garhoud and Port Saeed, to the south-west. The Al Garhoud area is also home to Emirates Post (Empost), which provides local and international express services. A short distance to the west of the Al Quoz industrial zone lies the affluent Jumeira residential community, where a number of professional offices (e.g., architects, engineers, software, high-tech companies), art galleries and cultural establishments, cafes and restaurants, and recreational facilities (e.g., gym clubs, dance clubs) are also located (Al-Qaydi and Brownson 2007). Capitalizing on access to international tourists and business travellers, many of Dubai’s state-of-the-art projects are also located within 24 km of Dubai International Airport. For instance, the iconic Burj Khalifa—the tallest skyscraper in the world—is located to the immediate south-west of the airport.

Partly as a result of all this development, between 2002 and 2011 the number of hotel rooms in Dubai increased by 132%, from 231,700 to 538,280, and the number of hotel guests grew by 76.8%, from 4.1 million to 7.2 million (Dubai Department of Tourism and Commerce Marketing 2012). Increased passenger traffic to the UAE further fuelled growth at...
each Emirates airport, but especially at Dubai International, which hosts Emirates Airlines. Another landmark development project is the Deira Palm Island, located to the north-west of the airport—a large-scale residential project anticipated to accommodate around 1 million residents upon completion.

![Diagram of urban development around Dubai International Airport and Al Maktoum International Airport.](image)

**FIGURE 1**
Urban development around Dubai International Airport and Al Maktoum International Airport.
Source: Spatial data from Dubai Airports Company, Dubai Police Department, Dubai World Central (Dubai Aviation City Corporation), Dubai Municipality (GIS Department), and Dubai Metro.
According to Kasarda (2008, 13–14), the aerotropolis is optimized by corridor and cluster development … expressway links (aerolanes) complemented by airport express trains (aerotrails) bring cars, taxis, buses, trucks and rail together with air infrastructure at the multi-modal commercial core (the airport city). Aviation-linked business clusters and associated residential developments radiate outward from the airport city, forming the greater aerotropolis.

Dubai International Airport mimics some of these trends, since it is connected to the rest of the Dubai Emirate and the adjacent emirates through a series of major thoroughfares that run roughly parallel to the Arabian Gulf or cross inland. In accordance with Kasarda’s model, these major lines of transportation link more strictly aeronautically oriented businesses to industries and attractions that are not directly related to air and sea transport. The major thoroughfares that supplement the existing rail systems include Mohammad Bin Zayed Road, Sheikh Zayed Road, Sheikh Rashid Road, and Al Ettihad Road (see Figure 1).

As Figure 1 shows, each major transportation lane is dotted with organizations that fit into the same major categories of firms and attractions that mimic the more urban centre. For example, transport-related companies are certainly well represented along Sheikh Rashid Road, which connects a number of firms with a high propensity to ship by air (e.g., D&F Logistics LLC, Overseas Development LLC, Alpha Star Shipping LLC) to Dubai International Airport. Yet a distinguishing feature of the aerotropolis is its role as an attraction itself, facilitated by its function as a hub. For example, Figure 1 shows a number of firms located within 3 km (2 miles) of the Dubai airport attracting medical travellers, including firms in the Dubai Health Care City (DHCC), a cluster of global health care providers such as the American Academy of Cosmetic Surgery Hospital, Boston University Institute for Dental Research and Education, the London Center for Aesthetic Surgery, the Moorfields Eye Hospital, and the Dr. Sulaiman Al Habib Medical Center. In 2010, more than 400 000 patients visited the DHCC, mainly from the United States, the United Kingdom, India, France, the Philippines, and the Middle East, seeking quality health care and cost savings (Woodman 2012). To meet their needs, medical travellers and other professionals travel to and from such destinations by way of Dubai International Airport, to which Sheikh Rashid Road and the green metro line connect.

In addition, clusters of businesses catering to the ancillary needs of air travellers and local professionals are linked to Dubai International Airport through two roads that run parallel to the Gulf and connect Dubai to other emirates to the north and south. Closest to the Gulf, along
Sheikh Zayed Road and the red metro rail transit line—the airport urban corridor—are a variety of organizations such as the Dubai Mall, Knowledge Village, Emirates Mall, and Jebel Ali Free Zone (JAFZ) (see Figure 1). Our survey located 25 freight forwarding and logistics companies in JAFZ shipping daily or weekly through Dubai International Airport (e.g., Conquest Worldwide Logistics, Consolidated Shipping Services LLC, TTL Shipping & Logistics LLC, and Expeditors International Forwarding & Clearing LLC). Dubai Mall attracted 65 million visitors in 2012, a >20% increase from 54 million visitors in 2011 (TTG MENA 2013). Such highway and metro rail access can be a crucial element of any aerotropolis urban form, since it facilitates the movement of people and cargo on the ground both to and from the airport.

Unlike Dubai International, which is located in the urban core of Dubai City, Abu Dhabi Airport is strategically located on the urban periphery of the Capital City District, at the intersection of several major thoroughfares with available land for further expansion (see Figure 2). The Emirate of Abu Dhabi is the largest of the seven emirates in terms of total land area (85% share), and the city of Abu Dhabi is the federal capital of...
the UAE. Etihad Airlines—Abu Dhabi’s flagship carrier—has major traffic destinations in the Middle East, India, and Europe. The airport is now owned and operated by the Abu Dhabi Airport Company (ADAC), a government-related entity entirely owned by the Abu Dhabi government.

The densely developed Capital City District is located within 5 km of the airport and includes many embassies, government departments, and international organizations clustered together with various knowledge-based industries, technology firms, research and development facilities, conference complexes, and tourist attractions. The Capital City District and a traditional commercial business district are connected to the airport through a well-developed surface transport network that consists of major highways and will soon include public transit links (tram and passenger rail). The Abu Dhabi master plan includes a large-scale mixed-use development project on nearby Saadiyat Island that will feature a “cultural district” of museums and related cultural attractions, spearheaded by franchise branches of the Guggenheim Museum, the Louvre, and New York University.

Mafraq and Mussafah, service-based business districts south of Abu Dhabi airport, are linked by highway and the forthcoming freight rail corridor, which will likely facilitate increased production and commodity flows. A hi-tech park and a business and logistics park are located within 5 km of the airport. To the north-east of the airport is Yas Island, where
the Ferrari World Theme Park is located. West and south-west of the airport is the residential Khalifa City, part of the Abu Dhabi Capital District, home to many national and foreign residents, in part because of its proximity to the airport. Other developments in close proximity to the airport include Motor World, Zayed Global City, Al Raha Beach development, Al Raha Gardens, and Raha Rest. Within 24 km of the airport, smaller service-based industries are clustered in the Mafraq and Mussafah areas—south and south-east of the airport. The residential Mohammed Bin Zayed City, Al Shamkah, and Al Shamkah South are also located adjacent to the airport. These mini-cities include additional facilities and services such as parks, shops, mosques, hospitals, shopping, clinics, health clubs, and schools.

Al Maktoum International Airport

Perhaps the most ambitious aerotropolis project in the world is Al Maktoum International Airport (previously Jebel Ali International Airport), which is planned to be the largest hub airport in the world in terms of air passengers and air cargo. Current projections suggest that Al Maktoum will be able to accommodate up to 160 million passengers and over 12 million tonnes per year when operating at full capacity, exceeding both Atlanta and Memphis airports in terms of total passengers and cargo, respectively (Dubai World Central n.d.). Upon completion, Al Maktoum will be 10 times the size of Dubai International Airport, including five parallel runways that are expected to handle the next-generation A380 double-decker wide-bodied jumbo jet aircraft. Ultimately, Al Maktoum is intended to be the home base for national flag carrier, Emirates Airlines.

Al Maktoum Airport is planned to be surrounded by many developments that would match the aerotropolis concept. Kasarda (2008, 4) has suggested that “Dubai World Central sets an extraordinarily high bar for its airport city and aerotropolis development that constitutes the most ambitious model going forward in terms of vision and scale.” This vision includes a planned airport city, Dubai World Central (DWC), a 140-km² planned urban community (see Figure 1). The land acreage of DWC is almost twice the size of Hong Kong Island, and it is anticipated that it will ultimately accommodate nearly 1 million residents. Although it is unclear as yet where the demand for DWC will come from, eventually, the overall strategy is to build six interrelated mini-cities immediately contiguous to the airport, including an Aviation City, a Commercial City, an Exhibition City of convention centres and hotels, a Golf City, a Logistics City, and a Residential City. Each of these distinctive mini-cities is currently being planned by DWC-related real-estate firms; road and rail corridors will link
DWC to both Al Maktoum and the adjacent Dubai Airport to facilitate air cargo movement and passenger transfers between both airports.

The existing businesses already operating in the Jebel Ali Free Zone (JAFZA) and Jebel Ali Industrial area are expected to provide additional demand for air transportation services at Al Maktoum Airport. JAFZA is the biggest exporting zone in Dubai, accounting for 77.6% of Dubai’s non-oil foreign trade in 2007 (National Media Council 2009). It hosted more than 6400 companies from 120 different countries (HLB Hamt n.d.), including various business centres, offices, factories, and warehousing and distribution facilities for international and domestic firms. A mixed-used Dubai Investment Park located to the north of the airport is also planned.

Other than the DWC project, the ongoing construction of the Dubailand entertainment complex within 24 km to the north-east of Al Maktoum Airport is projected to cover an area of 278 710 km² (3 billion square feet), including approximately 45 megaprojects and at least 55 hotels that will ultimately host about 200 000 visitors a day (Gulfnews 2007).

Another important project just south of Al Maktoum Airport is the upcoming Dubai Industrial City. This project is designed based on a “city within a city” theme. Other critical investments within 24 km of Al Maktoum Airport include Jumeira Palm and Jebel Ali Palm islands, Dubai Front Water, Jebel Ali Port, and Jebel Ali Village.

**Competitive Effects of Nearby Seaports and Airports, and Limits to Expansion**

Analysis of how the aerotropolis strategy plays out with respect to the competitive effects of nearby seaports and airports has been fairly limited. A better understanding of these interactive effects is crucial in the UAE, a relatively small country in terms of land area that has spawned several major airports and seaports in a short space of time. In terms of air–sea connections, seaports can both complement and compete with air transportation. Port Saeed—which is located just 2.4 km (1.5 miles) from Dubai International Airport—provides major docking and logistical services for small ships and ferries in the nearby Dubai Creek. The inter-modal role of Dubai as a sea–air transport hub has increased air cargo activities at the airport, in part because of the short transfer time for full container load movements between Jebel Ali and the Dubai Cargo Village (Wilson 2007). The proximity of JAFZA to both Al Maktoum and DWC allows companies to ship cargo from sea to air within 20 minutes (HLB Hamt n.d.). Interestingly, a number of companies located in neighbouring Abu Dhabi and Sharjah Emirate tend to use the Dubai Airport facilities less frequently because of the availability of cargo services at Abu Dhabi and Sharjah airports.
A number of Dubai International Airport’s customers are located in close proximity to the other UAE airports, which results in some diversion of cargo traffic to these nearby airports. For example, 174 (60%) of the 289 respondents who frequently use Dubai Airport facilities stated that they also ship cargo through other adjacent airports like Al Maktoum International Airport, Sharjah International Airport, and Abu Dhabi International Airport. Conversely, some more distant companies (e.g., Fujairah Export Import Co., Galaxy Shipping Agency) that are actually located in Fujairah Emirate (within 2 hours’ travel time of Dubai International Airport) tended to ship their cargo daily through Dubai because of the perceived lack of needed services and requisite flight operations at the nearby Fujairah International Airport.

While Kasarda and other authors offer generally uncritical and positive assessments of the growth prospects of the aerotropolis approach, recent economic challenges have made it less clear that there will be enough demand for all the planned development, particularly given the proximity of airports (e.g., that of Sharjah International Airport to Dubai International). That said, passenger demand in the UAE is largely unrelated to the domestic market; the UAE relies heavily on international traffic, captured based on the country’s strategic geographic location halfway between Asia and Europe and between Australia and Europe. Much of this transit and stay-over traffic has been generated by UAE’s aggressive negotiation of “open skies” agreements with various European and Asian partners and by the leveraging of sixth freedom rights, which enables Emirates Airlines, Etihad Airlines, and others to carry passengers from Asia through Dubai and Abu Dhabi to Europe, and vice versa.

The Role of Proximity and Connectivity

The aerotropolis model places a fundamental emphasis on proximity to the airport to deliver the time and cost savings needed to meet the expectations of just-in-time delivery and smaller inventories in the global economy. A sample of freight forwarders and logistics companies and carriers (n = 306) were interviewed to determine what proportion of their shipping activities were carried out by air. The majority of respondents (n = 289, 94%) reported shipping their cargo through Dubai International Airport, while 5.6% (n = 17) ship through other airports, including Abu Dhabi and Sharjah. We found a positive, moderately strong, and statistically significant correlation (rs = 0.56, p = 0.000) between a firm’s travel time to the airport and the frequency of its use of airport facilities. In other words, companies located closer to Dubai International Airport tend to ship freight to the airport frequently, while companies located...
further away from the airport tend to use cargo facilities at the airport less frequently. About 76% of respondent companies located within 30 minutes’ travel time from the Dubai Airport shipped through the airport daily or weekly.

Additionally, respondents using Dubai International Airport were asked to rank their reasons for doing so; 51% ranked connection to global markets and flight frequency as their primary reason for choosing the Dubai airport. Perhaps reflecting the role of regional airport competition, the second most common reason respondents gave for selecting Dubai Airport was better services (33% of all surveyed firms; see Table 2). Approximately 28% ranked proximity of its location as the third most important reason for using Dubai International Airport for shipments, and nearly (about 47%) identified reasonable fees as the fourth most important factor. The implication here is that firms’ strategic connectivity to the global market, rather than cost factors, is the most powerful motivating force in aerotropolis usage, and proximity may be considered a reflection of this more fundamental feature.

Companies were also asked to list the main carriers they usually ship their cargo through; 69% used Emirates SkyCargo (an air freight division of Emirates and the main cargo carrier at Dubai International Airport) because of its direct connection to many destinations, frequent flight schedule, quality of service (online booking, reliable and fast delivery, and helpful employees), good prices, and long-standing relationships with freight forwarders and logistics companies. Other major foreign carriers (e.g., Lufthansa, Qatar Airways, Air France, FedEx, and Cathay Pacific) also play a pivotal role at the Dubai airport, providing freight services that entice different businesses to use airport services. These findings are consistent with the idea that the highest priority is placed on cultivating the maximum number of connections in the global marketplace.

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Contextualizing the Aerotropolis: Political–Economic Considerations

Kasarda’s vision of the aerotropolis assumes a neo-liberal “trickle-down” approach, one that is generally technophilic and pro-growth. But for sceptics, including those who might refrain from even using the term aerotropolis, this vision is subject to a number of critiques highlighting environmental, noise, economic fairness, social justice, and other concerns (Charles et al. 2007). In response, in addition to re-emphasizing the general benefits of a laissez-faire approach, Kasarda (2010) has acknowledged two types of aerotropolis growth paths: one in which an aerotropolis grows “organically” or “spontaneously,” and thus is subject to the ills mentioned by critics, and another in which it is “planned.” As an example of the former, many airports in North America and Europe were built during the 1950s and 1960s, originally on the periphery of major urban areas, and now find themselves encircled by subsequent metropolitan development, which limits their opportunities to grow and expand (Rodrigue et al. 2006). The second type of growth path offers an idealized example that purports to address critiques. The ideally planned aerotropolis includes features that reduce negative impacts, such as dedicated highway “aerolanes” and “aerotains”; spatially segregated logistics/warehouse facilities; residential building away from takeoff zones; and cluster rather than strip development (Kasarda 2010; Clapp 2012).

A critical view of the aerotropolis must consider the relative importance accorded to private versus public ownership, the potential negative impacts of emphasizing profit over social justice and humanitarian concerns, monopolistic abuses, and state corruption. Unlike the local-scale airport city and airfront models, the aerotropolis is assumed to be managed largely by private developers and driven by a free market economy (Schaafsma 2008). References to the economic potential of the model abound. For example, Kasarda (2009) mentions that in 2008, Incheon Airport generated over $1 billion in retail revenues, and with a projected 17% annual growth rate in retail sales, the airport has set a target of $3 billion in sales by 2015.

For those who believe that solutions to issues such as negative environmental impacts must come in large part from the state (e.g., through strong environmental regulation), state policies become a key factor in aerotropolis viability. The Dubai Emirate appears to operate on a unique “state capitalism” model involving a form of coordinated public–private strategy, although this is less explicit than in a Western context. For example, although recent UBS and PricewaterhouseCoopers audits have indicated that Emirates Airlines does not receive direct state aid, it is still unclear how the public–private partnership between the airline and the
Dubai government really works. The influence of Emirates Airlines as well as Dubai International Airport seems to be partly related to the formation of the Emirates Group, a large holding company that has effectively coordinated national travel policy in conjunction with the Airport Authority and the national government. The Emirates Group represents a full quarter of Dubai’s GDP and is the Dubai Emirate’s largest company (Emirates Group 2010). Sheik Ahmed bin Saeed Al-Maktoum—an uncle of Dubai’s ruler—is not only chairman of Emirates Airlines but also oversees the airports, the Civil Aviation Authority, and the Supreme Financial Committee. As a result, the airline is effectively a strategic arm of the state, since airline, airport, and related economic development policy are very well coordinated. The corporate style of the Dubai government, with its heavy focus on diversifying its economy by investing in different mega-tourism projects, has worked in favour of aerotropolis development.

To integrate environmental awareness, plans for the world’s first carbon-neutral city are unfolding in Masdar City, located to the west of Abu Dhabi International Airport, which is already home to the headquarters of the International Renewable Energy Agency (see Figure 4). A proposed eco-friendly Hydra City that will focus on reducing energy consumption is also planned north of the Abu Dhabi airport. In 2009, Masdar City and Etihad Airways signed a partnership agreement to develop sustainable and efficient solutions to reduce the airline’s carbon footprint and improve its waste-management and energy-saving plans (Etihad Airways 2009). This step supports Abu Dhabi’s emphasis on clean technology as well as the general shift in the airline industry toward stressing sustainable energy sources and efficient emission-reduction systems. However, the recent financial crisis pushed back the opening date to 2020, and plans for Masdar City are now being re-evaluated. Also in part because of the impact of the continuing financial crisis in Dubai, Emirates Airlines has recently had to deny rumours of a potential merger with Etihad Airways, the national flagship carrier of Abu Dhabi (Gulfnews 2008; Bowman 2008). Finally, if international connectivity is a key factor in stimulating aerotropolis-style growth, the aerotropolis model is no more sustainable or stable than global economic markets; by implication, instability in world markets and the changing dynamics of the global economy may well pose challenges to the viability and long-term stability of the aerotropolis model.

Another concern relates to the nature of the workforce generated by aerotropolis-style developments. Commercial and residential land prices and rental rates can be prohibitively expensive in many aerotropolis settings, particularly for the low-wage workers in some of the less well paid transportation-related service industries. For example, in 2003, the
Al Qusais industrial zone hosted 883 firms and employed 10,628 workers, but the majority of these lived in the nearby Sharjah and Ajman Emirates, partly because rents are cheaper there than in Dubai (Al-Qaydi and Brownson 2007). The UAE has one of the highest proportions of foreign-born workers in the world, which raises questions about facilities’ being run with very low-wage immigrant workers. This phenomenon is perhaps linked to the rise of low-cost carriers bringing workers to and from the area. While Kasarda and his supporters have claimed that average salaries tend to improve and increase over time (Clapp 2012; Kasarda 2009, 2010; Kasarda and Lindsay 2011), more research is needed before this can be determined with certainty.

**Conclusion and Implications**

Two different forms of aerotropolis appear to have emerged in the UAE. First, both Abu Dhabi and Dubai International Airports appear to have had a more conventional urban evolution. Both are located in relatively densely settled urban areas near the central business district. Dubai International Airport, in particular, has developed a “spontaneous”
aerotropolis in a compact urban area, resulting in a shortage of suitable land to expand. On the other hand, Al Maktoum Airport has been explicitly developed based on an “ideally planned” aerotropolis vision in a largely peripheral setting designed to accommodate the Dubai World Central megaproject. As a result, Al Maktoum is surrounded by a critical mass of industrial, residential, and recreational clusters designed to produce the domestic demand required to support airport operations. Much of this airport-integrated urban economic region seems to mimic the conceptual framework of Kasarda’s aerotropolis model.

A key factor in any aerotropolis-based growth strategy is the way in which air transportation-related service industries interact with each other and with the airport, and much of this interaction depends on the unique configuration of land uses around the airport and the level of global connectivity offered by the airport and related airlines. The spatial interactions uncovered in this study suggest that a statistically significant relationship exists between travel time and frequency of trips of cargo-related businesses to Dubai International Airport and the frequency of shipping through the airport. Our data also suggest that the well-developed, integrated multimodal urban corridors that radiate out from the major UAE airports connect commercial activities, residential areas, hotels, conventions centres, and many shopping malls in very different ways, depending on the setting, and often do not perfectly fit the aerotropolis model.

Kasarda (2000, 40) has argued that “planners and developers who design and build infrastructure and facilities that are consistent with the form and function of aerotropolis can contribute substantially to the economic competitiveness of urban areas and to the emerging needs of business.” The implication of this argument is that an emerging market like the UAE, and Dubai in particular, must first provide the necessary infrastructure in order to generate demand. Our analysis indicates that the UAE is attempting to implement an aerotropolis-style strategy by building entirely new cities such as DWC to attract both a skilled labour force and varied knowledge-based industries to the region while simultaneously nurturing cargo and passenger demand at nearby Abu Dhabi, Al Maktoum, and Dubai airports.

That said, the aerotropolis model needs further testing to consider the impacts of regions containing several airports and seaports, which can produce a more complex and competitive dynamic. A key variable for success is how well UAE’s emerging network of airports integrates with the seaports, especially the port of Jebel Ali, as the nation develops an enhanced and fully integrated multimodal transport policy.

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Note
1 Sixth freedom is the right to carry passengers or freight between two countries (A and B) through an airport in the home country.

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