

The wider economic benefits of airports

POSITION PAPER

Casper Klipp
Hans R.A. Koster

© 2026 Casper Klipp, Hans Koster

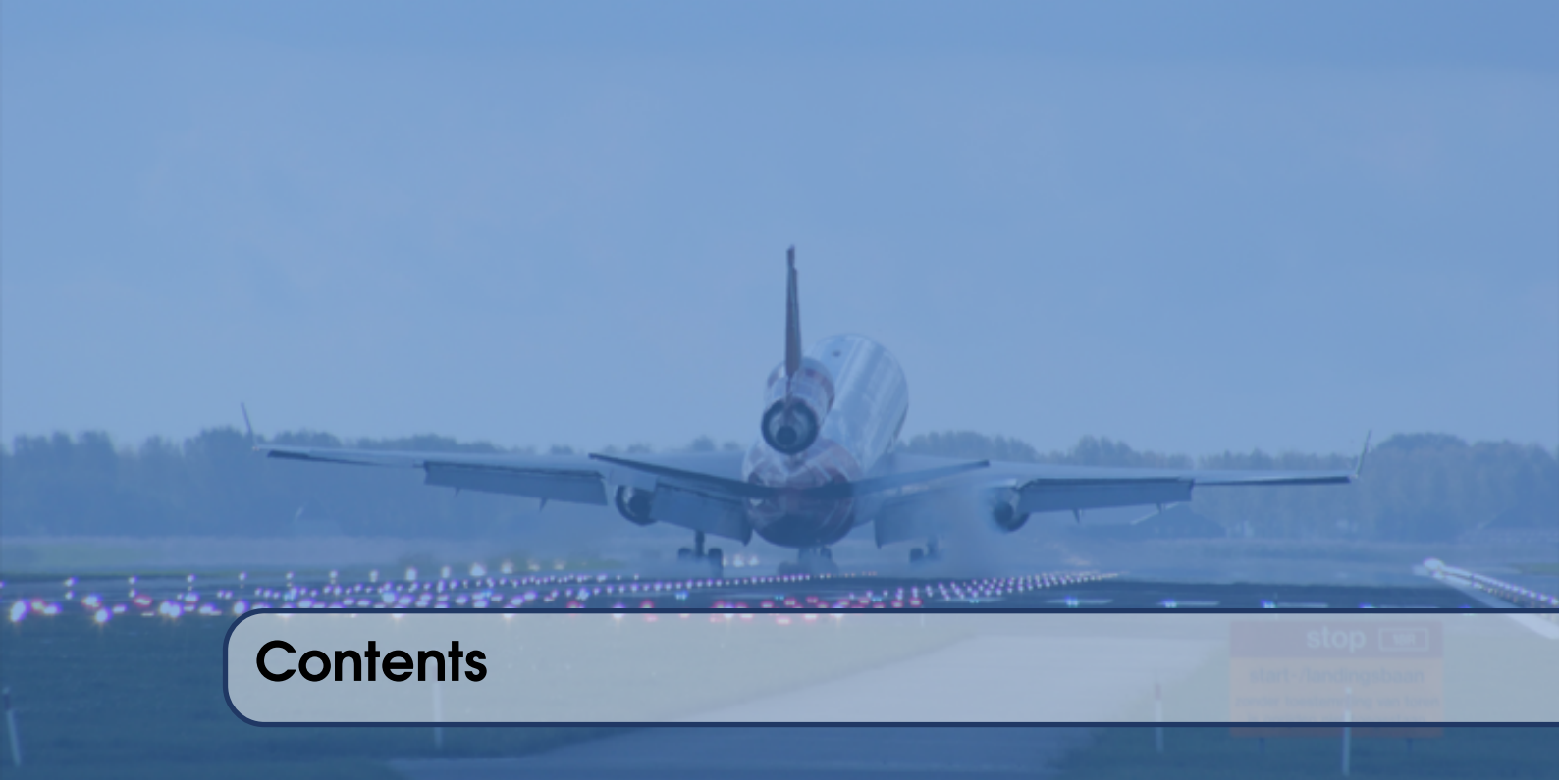
WWW.URBANECONOMICS.NL

Casper Klipp: Department of Spatial Economics, Vrije Universiteit Amsterdam. E-mail: c.klipp@student.vu.nl.

Hans R.A. Koster: Department of Spatial Economics, Vrije Universiteit Amsterdam, Tinbergen Institute, LSE and CEPR. E-mail: h.koster@vu.nl.

The front cover is from Pixabay.com and used under the Content License. Also the chapter images are from Pixabay.com and used under the Content License.

Version 1.0, November 2025



Contents

Summary / Samenvatting 5

1 Introduction 7

2 Direct effects 9
2.1 Definition 9
2.2 Results and international comparison 9

3 Indirect effects 11
3.1 Definition and mechanisms 11
3.2 Measurement and methodological issues 12
3.3 GDP and employment 13
3.4 Negative externalities 15
3.5 Other outcomes 16

4 General-equilibrium effects 17
4.1 Definition and mechanisms 17
4.2 Measurement and methodological issues 18
4.3 Evidence and implications 18

5 Conclusion 21
5.1 Main takeaways 21
5.2 Further research agenda 22

Bibliography 24



Summary / Samenvatting

Executive summary

Airports are critical nodes in the spatial economy, influencing trade, productivity, and regional development. This paper examines the wider economic benefits of airports—effects beyond direct employment—focusing on agglomeration economies, improved accessibility, and general equilibrium effects that reallocate activity across space. We review international evidence, highlight methodological challenges in establishing causality, and assess the role of reduced-form and quantitative spatial models. Empirical studies suggest that the wider economic benefits of airports are real in absolute terms but moderate in relative terms, with estimated elasticities between air connectivity and regional GDP or employment typically ranging from 0 to 10%. Applied to the Amsterdam metropolitan area, this would imply that a 10% increase in connectivity could raise regional GDP by roughly $0-2$ billion euros. However these numbers ignore potential important general equilibrium effects. Using the Dutch context, and Schiphol Airport in particular, we draw implications for infrastructure policy, stressing that airport appraisal must capture spillover benefits and long-run spatial adjustments . Finally, since there are large knowlegde gaps, we propose a research agenda to guide future work on the evaluation of airports.

Samenvatting

Luchthavens zijn cruciale knooppunten in de ruimtelijke economie; zij beïnvloeden handel, productiviteit en regionale ontwikkeling. Dit *position paper* onderzoekt de bredere economische baten van luchthavens die verder gaan dan directe werkgelegenheid. We benadrukken de rol van agglomeratievoordelen, verbeterde toegankelijkheid en algemene evenwichtseffecten die economische activiteit herverdelen over de ruimte. We bespreken de internationale literatuur, belichten methodologische uitdagingen bij het vaststellen van causaliteit, en beoordelen de rol van reduced-form- en ruimtelijke evenwichtsmodellen. Empirische studies laten zien dat de indirecte baten van luchthavens in absolute termen kunnen oplopen maar in relatieve termen bescheiden zijn, doorgaans overeenkomend met een elasticiteit van $0-10\%$ tussen connectiviteit en lokale BBP of werkgelegenheidsgroei. Toegepast op de metropoolregio Amsterdam, zou dit betekenen dat een 10% stijging in connectiviteit regionaal BBP met $0-2$ miljard euro kan verhogen. Echter, potentieel belangrijke algemeen evenwichtseffecten zijn hier niet in meegenomen. Voor de Nederlandse context, en Schiphol in het bijzonder, trekken we implicaties voor infrastructuurbeleid, waarbij we benadrukken dat een beoordeling van luchthavens ook de spillover-effecten en de langetermijn ruimtelijke aanpassingen moet omvatten. Ten slotte, aangezien er gaten in de literatuur bestaan, stellen we een onderzoeksagenda voor om toekomstig werk rond de evaluatie van luchthavens te stimuleren.



1. Introduction

Airports, and specifically large international hubs such as Amsterdam Schiphol Airport, play a crucial role in shaping the economic landscape of cities and regions. Schiphol, as one of Europe's busiest airports, connects the Netherlands to global markets, facilitating the flow of people, goods, and knowledge. The presence and continued development of Schiphol has sparked debate among policymakers, economists, and local communities about the magnitude and scope of the airport's impact. The direct effects—such as airport employment and airline expenditures—are relatively straightforward to quantify: in 2023 Schiphol directly supported around 67,000 jobs (roughly 57,000 full-time equivalents) and generated some €8 billion in value added annually (Decisio & Beelining 2024). With nearly 67 million passengers in 2024, its scale is comparable to Paris–Charles de Gaulle (70 million) and Frankfurt (61,5 million), while London Heathrow remains the largest European hub with around 84 million passengers (Statista 2024).

In contrast, Dutch regional airports such as Eindhoven (7 million passengers), Rotterdam–The Hague (2 million), and Maastricht Aachen (less than 0.5 million) operate at a much smaller scale, and their employment and GDP impacts are therefore limited (Pot & Koster 2022). Schiphol thus accounts for most of the country's international connectivity and wider economic footprint.

This central role has also made Schiphol the point of an increasingly polarized policy debate. On the one hand, Schiphol's hub status is viewed as vital for the Dutch economy, supporting the competitiveness of firms and maintaining access to global markets. On the other hand, the airport is associated with significant local and global externalities, including noise pollution, congestion, and CO_2 emissions. Recent policy has moved toward capping flight movements: the current aim is a decision that would allow a maximum of around 478,000 movements per year—below the roughly 500,000 the airport can currently accommodate—alongside restrictions on night flights and

proposals to shift short-haul routes to high-speed rail (Ministerie van Infrastructuur en Waterstaat 2024*a*,*b*). These illustrate the fundamental dilemma: should Schiphol expand, shrink, or restructure?

This policy debate also exposes a research challenge. While direct effects are relatively well understood, the wider economic benefits (WEB), through agglomeration, improved market access, and long-run spatial adjustments, remain much harder to quantify (Ahlfeldt & Feddersen 2018, Koster et al. 2021). A further complication is the risk of double counting: jobs directly generated at the airport should not be added again when estimating multiplier effects in the surrounding economy. Conventional appraisal methods, as applied in Dutch cost-benefit analyses under the OEI guidelines, therefore adopt a cautious stance: they focus on direct effects such as employment, time savings, and environmental costs, while typically confining the reallocation of economic activity across space as a qualitative discussion rather than as part of the analysis (Eijgenraam et al. 2000, CPB & PBL 2013).

In this paper we explicitly focus on the *wider economic benefits* of airports, which encompass both indirect and general equilibrium effects that extend beyond the operational activities of airports themselves. Our goal is to clarify what these benefits are, how they can be measured, and what the international evidence tells us about their magnitude. In doing so, we seek to provide policymakers and researchers with a clearer framework for evaluating the future of Schiphol and the Dutch aviation sector.

The remainder of the paper is structured as follows. Section 2 discusses the *direct* effects of airports, such as on-site employment, passenger and airline spending, and commercial activities. We place Schiphol in an international perspective and contrast its role with the modest footprint of regional airports, while also noting the methodological challenges of interpreting these headline figures, such as double counting.

Section 3 examines the *indirect* effects that arise through connectivity and agglomeration. We outline how airports reduce effective transport costs and strengthen knowledge spillovers, labour market pooling, and the sharing of specialised services. We then review the empirical evidence, which shows that airports raise productivity and employment, although the effects are relatively modest and concentrated in large hubs.

Section 4 turns to *general-equilibrium effects*. Here, we highlight how accessibility improvements ripple through goods, labour, and land markets, affecting both neighbouring areas and other airports. Evidence from rail and road shows that transport shocks reshape the geography of activity, yet comparable work on airports is still scarce.

Section 5 concludes by stressing that the wider benefits are real but uneven and can be overstated unless spillovers and spatial reallocations are carefully integrated into the appraisal. Section 5.2 outlines a research agenda, emphasizing the need for spatial general-equilibrium models to evaluate the policy consequences of flight caps, modal shifts to high-speed rail, capacity expansions, and even counterfactuals such as relocating Schiphol.



2. Direct effects

2.1 Definition

Direct economic effects refer to the immediate outcomes of airport operations that take place on or around the airport site. These include jobs within the airport perimeter (e.g. airline staff, ground services, security, retail), expenditures by airlines and passengers, and revenues from commercial activities in terminals (Button & Taylor 2000, Hakfoort et al. 2001). Airports also generate direct effects through capital investment: the construction of runways, terminals, and related infrastructure produces temporary jobs and demand for construction services. Because these outcomes are visible, quantifiable, and often highlighted in political debate, they have long dominated conventional impact studies (Adler et al. 2024). Taking the total number of jobs or GDP generated directly by the airport seems straightforward, but may ignore that they come at the expense of jobs in other sectors. Hence, interpreting any number as a total effect on the economy is tricky.

2.2 Results and international comparison

Despite this caveat, direct effects at Schiphol are substantial. The most recent estimate, by Decisio & Beelining (2024), puts direct employment at the Schiphol cluster at around 66,800 jobs—roughly 57,000 full-time equivalents—in 2023, generating some €8.25 billion in value added, or about 0.8% of Dutch GDP. Labour productivity among these directly employed workers lies about a third above the national average, reflecting the relatively high-value nature of aviation-related activity. However, the exact number depends strongly on how "direct employment" is defined. In the narrowest definition, direct jobs include only employment within the core aviation sector–namely the airport authority (Royal Schiphol Group), airlines such as KLM, and air traffic control. A

broader definition also counts on-site services providers whose activities are present at the airport, such as catering services and cleaning companies. These definitional choices explain why older studies report a wider range of roughly 60,000–90,000 direct jobs (Burghouwt et al. 2017): studies using the narrow definition emerge at the lower bound, while those using the broader definition end up at the higher figures.

Schiphol's footprint places it firmly among Europe's largest hubs. Paris–Charles de Gaulle employs around 75,000 workers (roughly 0.3% of French GDP), Frankfurt more than 100,000 (0.6% of German GDP), and London Heathrow about 76,000 (0.3% of UK GDP). In contrast, Dutch regional airports such as Eindhoven (7 million passengers), Rotterdam–The Hague (2 million), and Maastricht Aachen (fewer than 0.5 million) only have a couple hundred employees each and their contribution to the national GDP is negligible (Pot & Koster 2022). Schiphol therefore dominates the Dutch airport system not only in passenger volumes but also in terms of employment and value added.



3. Indirect effects

3.1 Definition and mechanisms

Indirect economic effects refer to the wider benefits of airports that occur outside the airport area. They arise because better air connectivity reduces effective travel costs, enlarges market access, and allows firms and workers to interact more intensively across space. These benefits are not generated by airport jobs or on-site spending, but by the way improved accessibility reshapes surrounding economic activity.

The main mechanism through which these indirect effects operate is *agglomeration*. A large body of literature shows that when firms and workers are brought closer together in economic terms, productivity rises (Duranton & Puga 2004, Rosenthal & Strange 2004, Glaeser & Gottlieb 2009). Airports contribute to this by reducing travel times to distant markets and business partners, increasing the functional size of a city or region. In practice, this makes knowledge exchange easier and supports the development of specialized suppliers and services.[1]

First, airports support *knowledge spillovers*. Face-to-face contact remains crucial for the exchange of tacit knowledge and for building international business networks. Large hubs make it easier for professionals to attend meetings, conferences, or collaborative projects across the globe, which is particularly valuable in knowledge-intensive industries such as finance, ICT, and consulting (Sheard 2019).

Second, airports facilitate the *sharing of inputs and services*. Industries that depend on just-

[1] Another potential source of agglomeration is labor market pooling. However, we argue that for international hubs such as Schiphol this channel is of limited relevance: people do not use planes for daily commuting, so the effective local labor market remains unchanged. By contrast, in larger countries such as the United States, air travel can occasionally foster labor pooling for specialized sectors, but this effect remains of small magnitude.

in-time delivery, high-value logistics, or fast international transport—such as pharmaceuticals, high-tech manufacturing, and fresh produce—benefit from clustering around major cargo hubs. Schiphol is one of Europe's largest freight airports, and firms in the surrounding region gain from quick access to international distribution networks and specialised logistics services (Green 2007). Beyond physical goods, hubs also sustain advanced business services. Even in the digital-age, face-to-face contact remains an important part in complex tasks, building trust, and coordinating large scale projects. For example the financial and consultancy firms at the Zuidas, who value the ability to reach global clients quickly, which helps explain the concentration of headquarters and specialised services in close proximity to the airport (Bel & Fageda 2008).

3.2 Measurement and methodological issues

Quantifying indirect effects is far from straightforward. A common reduced-form approach relates regional outcomes such as employment or GDP to measures of airport activity:

$$y_{it} = \beta_0 + \beta_1 A_{it} + \gamma X_{it} + \mu_i + \mu_t + \varepsilon_{it}, \tag{3.1}$$

where y_{it} denotes the outcome in region i at time t, A_{it} is a measure of connectivity (e.g. passengers, destinations, or seat capacity), X_{it} is a vector of control variables, and μ_i and μ_t are location and year fixed effects. The coefficient β_1 is usually interpreted as the elasticity of the outcome with respect to connectivity. However, without credible instruments this coefficient is likely biased upwards, since airports are disproportionately located in regions that are on increasing trends (Duranton & Turner 2012, Redding & Turner 2015). This matters not only for interpretation but also for any subsequent use of the estimate: an elasticity that suffers from this endogeneity will carry its upward bias into downstream cost–benefit calculations, so such point estimates cannot be plugged directly into a valuation of wider economic benefits. Researchers have tried to address this by exploiting incidental expansions of airports (McMillen 2004), predetermined plans or route allocations (Percoco 2010, Blonigen & Cristea 2015), or the historical persistence of airfields (Gibbons & Wu 2019). Each of these approaches helps, but a further complication is that spillovers extend well beyond the municipality hosting the airport, while displacement of jobs from competing hubs may happen.

These spillovers violate the Stable Unit Treatment Value Assumption (SUTVA), which requires that outcomes in one region are unaffected by treatments in other regions. This assumption is particularly problematic in the context of transport networks, where spillovers are very likely to be present (Duranton & Turner 2012, Redding & Turner 2015). When Schiphol expands its connectivity, part of the passenger and firm response is likely displaced from competing hubs such as Frankfurt or Heathrow, while surrounding municipalities may benefit from enhanced accessibility without hosting the airport themselves (Ahlfeldt & Feddersen 2018). In Section 4, we introduce spatial general equilibrium models that can capture such interactions in a consistent way.

Finally, impact studies frequently apply multipliers to capture induced employment in related

sectors. While multipliers can provide a sense of broader linkages, they also risk double counting. However, jobs that are reported as "induced" may in reality be displaced from elsewhere in the economy. For example, Hakfoort et al. (2001) estimate a multiplier of 2.0 for Schiphol, which inflates the total employment figure to as many as 180,000. Such numbers are politically salient but may exaggerate the genuine economic contribution of the airport.

3.3 GDP and employment

Despite the challenges of isolating causal effects, the empirical literature provides consistent evidence that airports can amplify agglomeration economies and regional productivity. It is important to stress that all studies discussed in this section attempt to capture *indirect* effects, such as sectoral gains in surrounding areas, while excluding the direct employment and GDP generated on-site.

Brueckner (2003) analyses U.S. metropolitan areas over the 1990s, exploiting variation in passenger volumnes across cities. Using regression models with metropolitan fixed effects, he shows that a 10% increase in passenger volumes is associated with a 1% increase in service-sector employment in U.S. metropolitan areas (elasticity 0.10). Because the strategy relies on cross-city changes in traffic, endogeneity remains a concern.

Sheard (2014) improves on this by focusing on tradable services and exploiting variation in international route structures across U.S. cities. The estimated elasticity of 0.22 suggests stronger effects for internationally orientated sectors. Yet the results can be biased since there is no quasi-experimental shock to flight connectivity. The results could overstate the causal role of airports and point more to underlying globalisation trends.

For Italy, Percoco (2010) uses provincial data and panel methods to estimate the impact of air traffic on GDP per capita. The estimated elasticity is small (0.045), which may reflect both Italy's reliance on surface transport and the study's limited ability to separate airport effects from broader regional dynamics. Endogeneity is again a concern, as local growth itself drives demand.

Pot & Koster (2022) offer stronger identification by combining panel regressions with an instrumental variable based on historical route structures for European regions. They report an elasticity of 0.106 overall, but only large hubs show significant effects (0.179). This suggests that much of the measured impact in concentrated in a handful of airports such as Schiphol, while medium and small airports show no effect. Even here, the exclusion restriction of the instrument is debatable, since historical route structures may correlated with long-standing regional economic conditions.

Blonigen & Cristea (2015) provide quasi-experimental evidence by studying the U.S. airline deregulation of the 1980s. which created exogenous variation in route expansion. Their difference-in-differences results indicate GDP gains up to 7.5% for connected cities. Importantly, even the authors caution these gains were highly uneven, concentrated in large diversified metropolitan areas, and likely reflect spatial reallocation of activity rather than aggregate national growth.

Finally, Campante & Yanagizawa-Drott (2018) provide the most convincing causal evidence to date by exploiting exogenous changes in long-haul connectivity (driven by technological advances in aircraft range interacted with geography) to show that better air links raise GDP and employment in connected cities. Specifically, their difference-in-differences model indicates that a 10% increase in a city's centrality in the long-haul air network leads to about a 2% increase in local GDP per capita, with effects concentrated in tradable services and knowlegde-intensive industries.

The overall picture is that indirect effects exist but are modest, usually in the order of $0-10\%$ in terms of elasticities between connectivity and local growth. These estimates are concentrated in large hub airports, while smaller regional airports show little measurable impact. It is important to stress that such elasticities indicate stronger growth in regions with better connectivity.

A crucial caveat concerns the way these elasticities are subsequently used. The reduced-form specification in Equation (1) only recovers a causal elasticity if the connectivity measure A_{it} is free of endogeneity—that is, if airports do not simply expand where growth is already occurring. Where this correction is weak or absent, the estimated coefficient β_1 blends the causal effect of connectivity with the confounding influence of pre-existing regional trends and reverse causality, and is therefore biased upward. In that case the point estimate cannot be taken as an input for the further calculation into an elasticity and, ultimately, into wider economic benefits: doing so mechanically propagates the upward bias into the appraisal. This is why we distinguish between studies that lean on credible instruments or quasi-experimental variation—whose estimates can, with due caution, inform such a calculation—and those that do not, whose point estimates are better read as upper bounds.

From an MKBA perspective, this suggests that wider economic benefits could in principle be represented as a modest percentage add-on to the direct effects. To illustrate the order of magnitude, Table 3.1 presents a simple back-of-the-envelope calculation for the Amsterdam region, approximated by the *COROP* (NUTS3) area that includes Schiphol Airport and its surrounding municipalities. The table applies a range of elasticities between 0.00-0.10 to a hypothetical 10% increase in air connectivity. These elasticities span the range commonly found in the literature, indicating that connectivity shocks are associated with GDP gains of up to 1% of regional output. In absolute terms, this corresponds to roughly €0-2 billion euros in additional annual economic activity. While these calculations are only indicative, they show that even modest percentage effects translate into non-negligible economic magnitudes for large hub regions such as Amsterdam. It should be stressed, however, that this add-on is only defensible to the extent that the underlying elasticities are causally identified; as emphasised above, point estimates that are not properly corrected for endogeneity tend to overstate the true effect and should therefore be treated as an upper bound in such calculations.

A final caveat concerns the *direction* of these effects. Almost all of the studies reviewed here identify the impact of *expansions* in air connectivity—new routes, added frequencies, or airport growth—rather than *contractions* such as the flight cap currently envisaged for Schiphol;

to our knowledge, no study directly estimates the wider economic benefits that are lost when aviation activity is deliberately reduced. Because the reduced-form elasticities are estimated from variation that runs in both directions, the natural working assumption is that marginal effects are approximately symmetric: a small reduction in connectivity would erase wider economic benefits of roughly the same order of magnitude that an equivalent expansion would create. The main qualification comes from the general-equilibrium evidence on hub location (Section 4): Redding et al. (2011) show that once a hub is lost it may not be regained, because sunk costs and network effects lock in the new configuration. For large or discrete losses—such as a substantial erosion of Schiphol's hub function—the downside could therefore exceed a mirror image of the expansion estimates, but for the marginal changes typically at stake in appraisal, symmetry remains the sensible default.

Table 3.1: Back-of-the-envelope GDP effects for the Amsterdam region

Elasticity	GDP change (%)	Implied change (€ billion)
0.02	0.2	0.4
0.04	0.4	0.8
0.06	0.6	1.2
0.08	0.8	1.6
0.10	1.0	2.0

Note: Calculations based on a regional GDP of approximately €200 billion in 2022 for the Amsterdam *COROP* (NUTS3) region, which includes Schiphol Airport and surrounding municipalities (CBS, 2022). This spatial scale is broadly comparable to the metropolitan units (MSA/NUTS3) used in Brueckner (2003), Sheard (2014), and Pot & Koster (2022).

3.4 Negative externalities

The benefits of airports do not come for free; large hubs such as Schiphol impose substantial costs on their surroundings. In the case of airports, noise pollution is the most prominent; aircraft noise affects the daily lives of residents who live under flight paths. Within MKBA frameworks, these costs are generally defined as *negative externalities*, rather than *wider economic costs* (SEO Amsterdam Economics et al. 2024). The housing market provides some of the clearest evidence of the local costs of airports. Properties located under flight paths or within designated noise contours typically sell at a discount, as households capitalise the aircraft noise into their willingness to pay. For the Netherlands, Dekkers & van der Straaten (2009) estimate a spatially explicit hedonic pricing model around Schiphol. Controlling for background noise from road and rail traffic, they find that aircraft noise has the largest marginal effect: a reduction of 1 dB increases the average house price by 1,459 euros, corresponding to an aggregate welfare gain of about 574 million for a 1 dB reduction across the study area. McMillen (2004) documents sizeable reductions in house prices around Chicago O'Hare following expansion: single-family houses located under flight paths lost between 6 and 9% of their values relative to unaffected areas. Similar evidence comes from Europe. Boes & Nüesch (2011), using rental data for Zurich, estimate that apartments rents fall by about

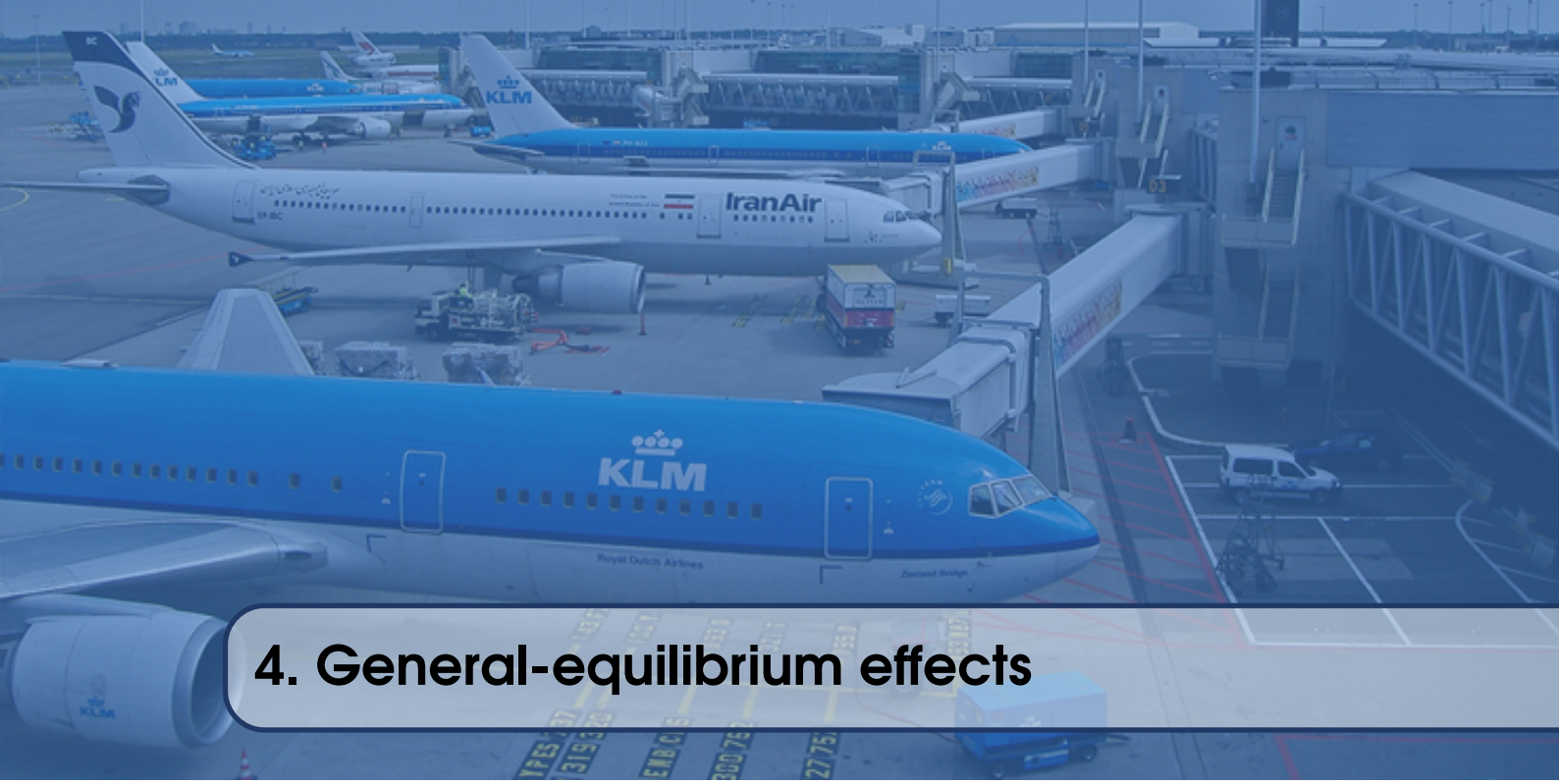
0.9% per decibel (dB) increase in aircraft noise. In U.S. housing markets, Cohen & Coughlin (2008) analyse sales prices near 23 airports and document average discounts of $0.5-0.7\%$ per dB of noise, with the strongest effects close to runways. More recently, Zheng et al. (2020) exploit the relocation of Hong Kong's Kai Tak Airport as a natural experiment. They show that the disappearance of aircraft noise led to a striking 24% increase in nearby house prices, with the effect diminishing by distance from the old airport site.

Beyond noise, airports also generate significant environmental externalities. Air traffic increases local concentrations of pollutants such as particulate matter ($PM_{2.5}$) and nitrogen oxides, which have direct health consequences for nearby populations. Schlenker & Walker (2016) show that congestion at Californian airports leads to spikes in local air pollution and hospital admissions, underlining the immediate health costs of aviation. A systematic review by Riley et al. (2021) shows evidence that airport activity raises exposure to these pollutants, with increased risks on adverse health outcomes. Focusing on a larger spatial dimension, Yim et al. (2015) estimate the global and regional health impact of aviation emissions, demonstrating that the damages extend well beyond the immediate vicinity of airports.

3.5 Other outcomes

Airports shape a range of outcomes beyond jobs and GDP, for example in tourism and knowledge production. On tourism, well-connected hubs act as gateways that determine whether destinations are on the international "map." Bieger & Wittmer (2006) conceptualize the air transport–tourism system and show why destination-level air access strategies–such as negotiating new routes, supporting charter traffic, or adjusting airport capacity to attract carriers—are pivotal for integrating regions into global tourist flows. Consistent with this view, Fageda et al. (2011) document that greater air service supply is associated with more tourist arrivals across Spanish provinces, underscoring that connectivity translates into measurable demand for local tourism industries.

Air connectivity also supports innovation and knowledge exchange. By lowering the cost of face-to-face contact over long distances, airports facilitate cross-border collaboration among firms and researchers. At the micro level, Bahar et al. (2023) focus on knowledge spillovers. Using detailed data on international flights and patent records, they show that an increase in non-stop connections between two locations raises the number of cross-citations between inventors and leads to a higher incidence of co-authored international patents. The estimated elasticities are economically significant: adding one new non-stop flight increases bilateral patent citations by around 6% and collaborative patenting by $3-4\%$, effects that do not occur when connections are only indirect. These results address that easier international travel doesn't just move people–it helps ideas travel too, leading to more shared innovation.



4. General-equilibrium effects

4.1 Definition and mechanisms

Most existing studies focus on *local* outcomes, such as the number of jobs or the level of GDP generated in the airport region. While useful, these reduced-form estimates ignore that airports operate within wider networks. If Schiphol expands, part of the additional passengers and firms will be diverted from rival hubs such as Heathrow or Frankfurt. Neighboring municipalities may benefit from better accessibility without hosting the airport themselves, while rising demand in the Amsterdam area may push up land prices and congestion. These mechanisms violate the *Stable Unit Treatment Value Assumption* (SUTVA) mentiond in Section 3, an assumption that may not hold in transport networks (Duranton & Turner 2012, Ahlfeldt & Feddersen 2018).

General-equilibrium (GE) models are designed to capture these interactions. They allow goods, workers, and land markets to adjust simultaneously across space (Bröcker & Mercenier 2011, Redding & Turner 2015, Allen & Arkolakis 2014, 2022). In such models, an airport shock affects the entire system through three channels. First, lower travel costs expand *market access*, raising real incomes as firms reach larger markets and consumers enjoy cheaper goods (Redding & Venables 2004). Second, workers respond to new opportunities by commuting further or relocating, generating *labour market adjustments* (Monte et al. 2018). Third, increased demand in hub regions pushes up rents and congestion, meaning that some of the benefits are offset by higher living costs in those places. The overall welfare impact, and the division of gains and losses across regions is determined by the interaction of these forces.

4.2 Measurement and methodological issues

General-equilibrium models formalise the idea that welfare depends not only on local income but also on access to markets through the transport network. A simple formulation is:

$$W = \sum_i \lambda_i \cdot \frac{Y_i}{P_i}, \tag{4.1}$$

where W is aggregate welfare, λ_i the population share of region i, Y_i local nominal income, and P_i the local price index. The price index P_i depends on trade costs τ_{ij} between regions i and j:

$$P_i = \left(\sum_j \left(\frac{p_j \tau_{ij}}{A_j} \right)^{1-\sigma} \right)^{\frac{1}{1-\sigma}}, \tag{4.2}$$

where p_j is the producer price in j, A_j a productivity shifter, and σ the elasticity of substitution across varieties. Lower trade costs τ_{ij} — for instance because Schiphol gains new long-haul destinations — reduce P_i, raising real income in i and changing demand across all regions simultaneously (Bröcker & Mercenier 2011, Redding & Turner 2015).

This framework highlights three differences from reduced-form regressions. First, it explicitly captures *displacement*: gains in one region may come at the expense of others. Second, it endogenises *price adjustments*: stronger demand in hub regions raises wages and rents, redistributing part of the benefits across groups. Third, it includes *spillovers*: regions without an airport can still gain from improved accessibility elsewhere. For example, a reduction in $\tau_{Amsterdam,NY}$ increases Amsterdam's market access but may reduce flows through Frankfurt; Utrecht and The Hague may enjoy better access without hosting the airport, while Amsterdam faces higher congestion and land prices.

Quantitative spatial GE models provide a coherent way to simulate counterfactuals — such as downsizing, expansion, or modal substitution. As Bröcker & Mercenier (2011) emphasize in their survey, this equilibrium perspective is essential for transport appraisal: ignoring feedback loops and reallocation risks produces incomplete estimates. However, as the authors note, the main challenge lies in calibrating key elasticities and trade cost parameters, which demands both credible reduced-form evidence and strong assumptions on the economy.

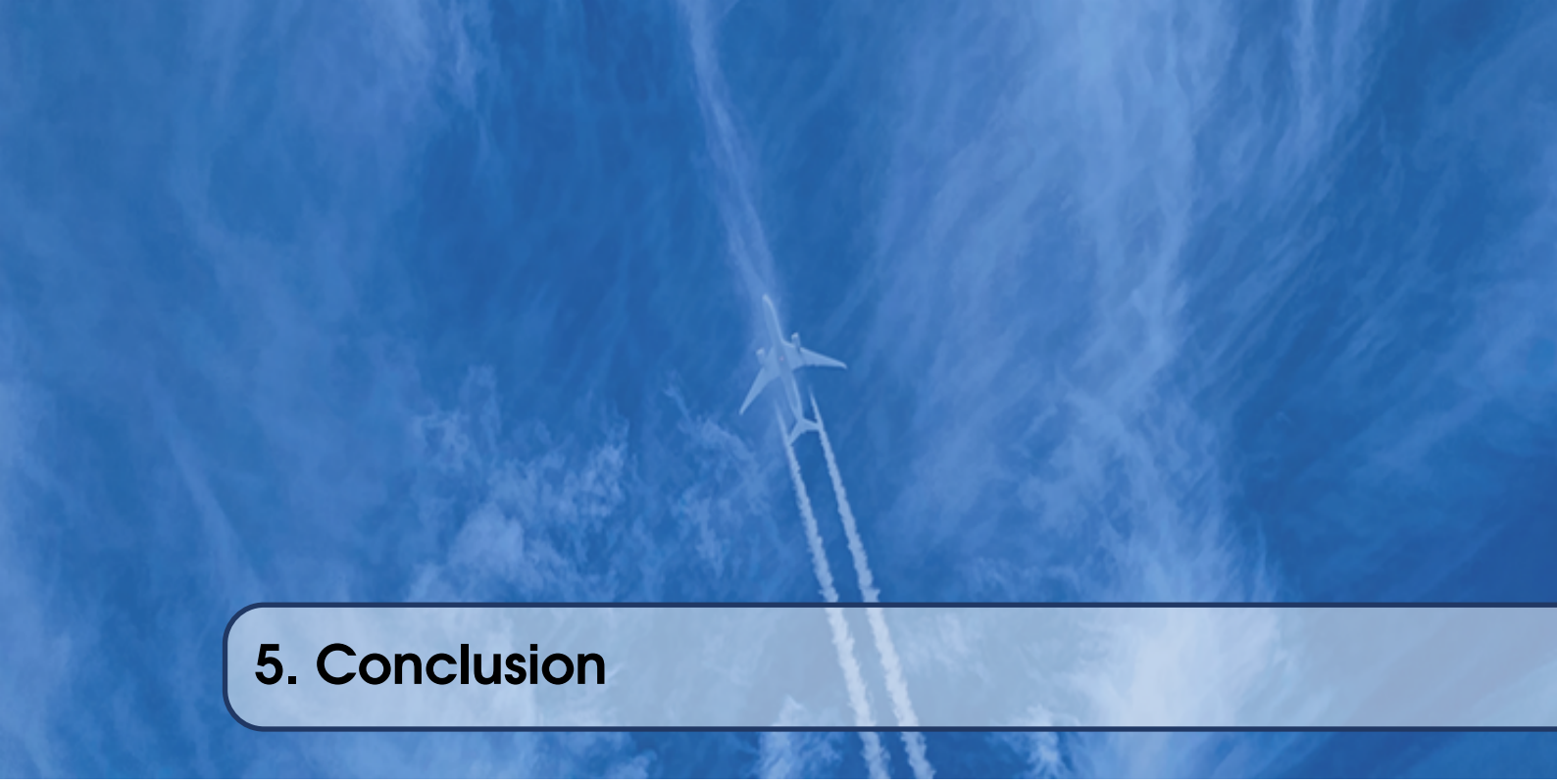
4.3 Evidence and implications

Evidence from other modes of transport illustrates the importance of GE effects. The U.S. interstate highway system reallocated manufacturing activity across the country (Duranton & Turner 2012). Railroads in the US raised real incomes by lowering trade costs and facilitating migration (Donaldson & Hornbeck 2016). High-speed rail studies provide a particularly relevant parallel.

Koster et al. (2021) provide a clear example of how GE models can be used to evaluate wider impacts of transport infrastructure. They estimate how improved accessibility affected productivity,

wages, and the spatial distribution of economic activity across cities. Methodologically, their study estimates several model parameters specifically for the Japanese context and then simulates how firms and households reallocate across space once access improves. The results show that national welfare increased, but that much of the gain accrued to already dominant cities, while peripheral areas often lost activity. In MKBA terms, this implies that the benefits of Schiphol go well beyond travel time savings: they also include productivity effects and redistributive impacts across regions. Ideally, such wider effects could be added to existing MKBA frameworks alongside conventional items like time savings, emissions, and noise, yielding a more complete welfare assessment. Of course, the feasibility of such an approach for European airports remains context-dependent and data-intensive, but the Shinkansen case demonstrates that it is at least possible in practice.

For aviation, the evidence is far more limited. To our knowledge, the only robust GE application comes from Redding et al. (2011), who exploit the division and reunification of Germany to show that the country's main hub shifted from Berlin to Frankfurt after World War II and, strikingly, did not return after reunification. This shift cannot be explained by fundamentals such as local GDP or market access; rather, sunk costs and network effects locked Frankfurt into its hub status. The lesson is clear: once a hub is established, its position is persistent, and policy choices can have long-term consequences. For the Dutch debate, this implies that restrictions or expansions at Schiphol may not simply shift traffic temporarily, but could accelerate the rise of rival hubs such as Paris or Frankfurt and permanently reduce the Netherlands' position in the global aviation network.



5. Conclusion

5.1 Main takeaways

Airports are not only transport facilities but key players in the spatial economy. Schiphol illustrates this clearly: it sustains tens of thousands of jobs and contributes close to one percent of Dutch GDP, yet these visible effects capture only part of its role. The deeper impact of airports comes through the way they reshape accessibility, alter the geography of firms and workers, and redistribute economic activity across space.

The international evidence confirms that wider economic benefits are real but limited: estimated elasticities between connectivity and regional GDP or employment typically fall in the range of 0.05–0.10, meaning a 10% increase in connectivity raises regional GDP by roughly 0.5–1%. These gains are also heavily concentrated in large hubs rather than spread evenly across regions. Because such a percentage applies to a very large economic base, the effect can still translate into a substantial sum in *absolute* terms: simple back-of-the-envelope calculations imply on the order of €$0-2$ billion in additional annual activity for the Amsterdam region. There is thus no contradiction between a small proportional effect and a sizeable euro figure; the two simply describe the same result on different scales. Smaller regional airports deliver little measurable impact, while global hubs like Schiphol, Heathrow, or Frankfurt disproportionately capture the benefits of connectivity. Much of what appears as new growth is in fact reallocation across space, which means that headline job numbers risk overstating the net contribution.

For policy appraisal, the implication is twofold. First, wider economic benefits can in principle be recognised in a MKBA, but this requires additional research techniques. Second, these indirect effects sometimes exclude negative externalities such as noise, air pollution, and congestion, which

are central to Dutch MKBA practice and must be explicitly accounted for. Reduced-form studies help to identify local effects, but they cannot capture network-wide spillovers, displacement across rival hubs, or long-run land and housing market adjustments. Embedding general-equilibrium effects in the analysis is therefore essential to avoid double counting and to arrive at a balanced welfare assessment.

Recognising airports as part of a wider spatial system is crucial. Decisions to cap or expand Schiphol will ripple through housing markets in Amsterdam, headquarters decisions in the Randstad, and the competitive balance with other European hubs. For policymakers, the bottom line is clear: wider economic benefits (including externalities) should neither be ignored nor exaggerated. They are modest, concentrated around large hubs, and best incorporated into MKBA through a careful combination of conventional measurements (such as time savings and environmental costs) and spatial general-equilibrium modelling. The real economic importance of airports lies not in the jobs inside the terminal, but in the way connectivity restructures regions and economies over the long run.

5.2 Further research agenda

A next step in this line of research would be to develop a regional general-equilibrium model of Schiphol and its role in both the Dutch and European economy. While direct and indirect effects have been studied extensively, we still lack a framework that can capture how airports reshape economic geography once we allow for network spillovers, housing markets, and labour mobility. This is a striking omission: railways and highways have been evaluated in this way for almost a decade (Donaldson & Hornbeck 2016, Ahlfeldt & Feddersen 2018, Monte et al. 2018, Koster et al. 2021), yet aviation—arguably the most international and long-distance mode—remains outside the scope of spatial general-equilibrium analysis.

We therefore propose a research agenda that develops such a framework along two complementary dimensions. At the regional level, the focus would be on how changes at Schiphol reallocate jobs, households, and investment across Dutch cities. Here the key question is not only whether Schiphol "creates" employment, but also whether growth is drawn away from other regions, how local wages and commuting patterns respond, and how negative externalities such as noise and environmental pollution are capitalised into nearby housing markets. At the international level, Schiphol can be embedded within the wider European airport system. This would allow us to ask to what extent a cap on flights at Schiphol simply diverts passengers and firms to Frankfurt or Paris, and to what extent it reduces Europe's overall connectivity. The knowledge and tools to build such models are already available, and applying them to airports would close an important gap in the current literature.

The value of this research agenda is that it speaks directly to questions that policymakers struggle with. What happens to national welfare when Schiphol expands or contracts? Who are the winners and losers across different regions? How large are the spillovers to neighbouring

municipalities that benefit from better accessibility without hosting the airport themselves? And what happens internationally when one hub grows at the expense of another? Reduced-form regressions cannot provide answers to these questions because they implicitly assume that regions are independent, an assumption that is clearly violated in transport networks (Duranton & Turner 2012, Redding & Turner 2015). A quantitative spatial model can provide those answers and simulate realistic counterfactuals.

Such a project would enrich the current literature by extending the tools of spatial general equilibrium to the aviation sector, where—to our knowledge—almost no robust applications exist. At the same time, it would deliver a policy-relevant framework for evaluating different futures for Schiphol, from downsizing and modal substitution to expansion. The outcome would be a richer understanding of how airports matter for both aggregate welfare and the geography of economic activity, in the Netherlands and beyond.

Bibliography

Adler, M., Petrat, A., Jongeling, A., Kieffer, M., de Jong, G., Behrens, C. & Lieshout, R. (2024), The Economic and Social Impact of European Airports and Air Connectivity, Technical report, SEO Amsterdam Economics. Commissioned by ACI EUROPE.

Ahlfeldt, G. M. & Feddersen, A. (2018), 'From Periphery To Core: Measuring Agglomeration Effects Using High-Speed Rail', *Journal of Economic Geography* **18**(2), 355–390.

Allen, T. & Arkolakis, C. (2014), 'Trade and the Topography of the Spatial Economy', *Quarterly Journal of Economics* **129**(3), 1085–1140.

Allen, T. & Arkolakis, C. (2022), 'The Welfare Effects of Transportation Infrastructure Improvements', *Review of Economic Studies* **89**(6), 2911–2957.

Bahar, D., Choudhury, P., Kim, D. Y. & Koo, W. W. (2023), 'Innovation on Wings: Nonstop Flights and Firm Innovation in the Global Context', *Management Science* **69**(10), 6202–6223.

Bel, G. & Fageda, X. (2008), 'Getting there Fast: Globalization, Intercontinental Flights and Location of Headquarters', *Journal of Economic Geography* **8**(4), 471–495.

Bieger, T. & Wittmer, A. (2006), 'Air Transport and Tourism—Perspectives and Challenges for Destinations, Airlines and Governments', *Journal of Air Transport Management* **12**(1), 40–46.

Blonigen, B. A. & Cristea, A. D. (2015), 'Air Service and Urban Growth: Evidence from a Quasi-Natural Policy Experiment', *Journal of Urban Economics* **86**, 128–146.

Boes, S. & Nüesch, S. (2011), 'Quasi-experimental Evidence on the Effect of Aircraft Noise on Apartment Rents', *Journal of Urban Economics* **69**(2), 196–204.

Bröcker, J. & Mercenier, J. (2011), 'General Equilibrium Models for Transportation Economics', *Handbook in Transport Economics* pp. 21–45.

Brueckner, J. K. (2003), 'Airline Traffic and Urban Economic Development', *Urban Studies* **40**(8), 1455–1469.

Burghouwt, G., Lieshout, R. & van Spijker, V. (2017), Economische effecten Schiphol: Over indirecte effecten en de gevolgen van capaciteitsschaarste, Technical Report 2017-55, SEO Economisch Onderzoek. In opdracht van Provincie Noord-Holland.

Button, K. & Taylor, S. (2000), 'International Air Transportation and Economic Development', *Journal of Air Transport Management* **6**(4), 209–222.

Campante, F. R. & Yanagizawa-Drott, D. (2018), 'Long-Range Growth: Economic Development in the Global Network of Air Links', *The Quarterly Journal of Economics* **133**(3), 1395–1458.

Cohen, J. P. & Coughlin, C. C. (2008), 'Spatial Hedonic Models of Airport Noise, Proximity, and Housing Prices', *Journal of Regional Science* **48**(5), 859–878.

CPB & PBL (2013), Evaluatie van grote infrastructuurprojecten: Leidraad voor kosten-batenanalyse, Update 2013, Technical report, Centraal Planbureau (CPB) en Planbureau voor de Leefomgeving (PBL).

Decisio & Beelining (2024), 'Belang Schiphol voor economie en vestigingsklimaat', Definitief eindrapport, oktober 2024. In opdracht van het Ministerie van Infrastructuur en Waterstaat. https://www.beelining.nl/wp-content/uploads/2024/12/Decisio_and_Beelining_Belang_Schiphol_voor_economie_en_vestigingsklimaat_Oktober_2024.pdf. Accessed: 2026-07-14.

Dekkers, J. E. C. & van der Straaten, J. W. (2009), 'Monetary Valuation of Aircraft Noise: A Hedonic Analysis around Schiphol', *Ecological Economics* **66**(11), 2850–2858.

Donaldson, D. & Hornbeck, R. (2016), 'Railroads And American Economic Growth: A "Market Access" Approach', *Quarterly Journal of Economics* **131**, 799–858.

Duranton, G. & Puga, D. (2004), 'Micro-Foundations of Urban Agglomeration Economies', *Handbook of Regional and Urban Economics* **4**, 2063–2117.

Duranton, G. & Turner, M. A. (2012), 'Urban Growth and Transportation', *Review of Economic Studies* **79**(4), 1407–1440.

Eijgenraam, C., Koopmans, C., Tang, P. & Verster, A. (2000), Evaluatie van infrastructuurprojecten: Leidraad voor kosten-batenanalyse, Technical report, CPB, NEI, Ministerie van Verkeer en Waterstaat en Ministerie van Economische Zaken.

Fageda, X., Jiménez, J. L. & Perdiguero, J. (2011), 'Air Services and Tourism Flows: An Empirical Analysis for Spain', *Journal of Air Transport Management* **17**(6), 375–379.

Gibbons, S. & Wu, W. (2019), 'Airports, Access, and Local Economic Performence: Evidence from China', *Journal of Economic Geography* **20**(4), 903–937.

Glaeser, E. L. & Gottlieb, J. D. (2009), 'The Wealth of Cities: Agglomeration Economies and Spatial Equilibrium in the United States', *Journal of Economic Literature* **47**(4), 983–1028.

Green, R. K. (2007), 'Airports and Economic Development', *Real Estate Economics* **35**(1), 91–112.

Hakfoort, J., Poot, T. & Rietveld, P. (2001), 'The Regional Economic Impact of an Airport: The Case of Amsterdam Schiphol Airport', *Regional Studies* **35**(7), 595–604.

Koster, H. R. A., Hayakawa, K., Tabuchi, T. & Thisse, J. (2021), 'High-Speed Rail And The Spatial Distribution Of Economic Activity: Evidence From Japan's Shinkansen', *RIETI Discussion Paper Series* (21-E-003).

McMillen, D. P. (2004), 'Airport Expansions and Property Values: The Case of O'Hare Airport', *Journal of Urban Economics* **55**(3), 627–640.

Ministerie van Infrastructuur en Waterstaat (2024*a*), 'Lager aantal vluchten voor Schiphol', https://www.luchtvaartindetoekomst.nl/actueel/nieuws/2024/12/06/lager-aantal-vluchten-voor-schiphol. Accessed: 2026-07-14.

Ministerie van Infrastructuur en Waterstaat (2024*b*), Schiphol: Krimpen of verduurzamen? Maatschappelijke Kosten-Batenanalyse, Rapport, Rijksoverheid. Bijlage bij Kamerbrief Hoofdlijnenbesluit Schiphol, 4 maart 2024.

Monte, F., Redding, S. J. & Rossi-Hansberg, E. (2018), 'Commuting, Migration, and Local Employment Elasticities', *American Economic Review* **108**(12), 3855–3890.

Percoco, M. (2010), 'Airport Activity and Local Development: Evidence from Italy', *Urban Studies* **47**(11), 2427–2443.

Pot, F. J. & Koster, S. (2022), 'Small Airports: Runways to Regional Economic Growth?', *Journal of Transport Geography* **98**, 103262.

Redding, S. J., Sturm, D. M. & Wolf, N. (2011), 'History and Industry location: Evidence from German Airports', *Review of Economics and Statistics* **93**(3), 814–831.

Redding, S. J. & Turner, M. A. (2015), 'Transportation Costs and the Spatial Organization of Economic Activity', *Handbook of Regional and Urban Economics* **5**, 1339–1398.

Redding, S. & Venables, A. J. (2004), 'Economic Geography and International Inequality', *Journal of International Economics* **62**(1), 53–82.

Riley, E. A., Cook, J., Wing, S. & Manning, B. (2021), 'A Systematic Review of the Impact of Commercial Aircraft Activity on Air Quality Near Airports', *International Journal of Environmental Research and Public Health* **18**(16), 8311.

Rosenthal, S. S. & Strange, W. C. (2004), 'Evidence on the Nature and Sources of Agglomeration Economies', *Handbook of Regional and Urban Economics* **4**, 2119–2171.

Schlenker, W. & Walker, W. R. (2016), 'Airports, Air Pollution, and Contemporaneous Health', *The Review of Economic Studies* **83**(2), 768–809.

SEO Amsterdam Economics, CE Delft & Signifcane (2024), Schiphol: krimpen of verduurzamen? een maatschappelijke kosten-batenanalyse, Technical Report 2023-27, SEO Amsterdam Economics.

Sheard, N. (2014), 'Airports and Urban Sectoral Employment', *Journal of Urban Economics* **80**, 133–152.

Sheard, N. (2019), 'Airport Size and Urban Growth', *Economica* **86**(342), 300–335.

Statista (2024), 'Passenger Traffic at Leading Airports in Europe in 2023', https://www.statista.com/statistics/1610514/passenger-traffic-leading-airports-europe/. Accessed: 2025-08-18.

Yim, S. H. L., Lee, D. S., Gilmore, C. K. & Barrett, S. R. H. (2015), 'Global, Regional, and Local Health Impacts of Civil Aviation Emissions', *Environmental Research Letters* **10**(3), 034001.

Zheng, X., Peng, W. & Hu, M. (2020), 'Airport noise and house prices: A quasi-experimental design study', *Land Use Policy* **90**, 104287.