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THINK

POLICY BRIEF

THE WIDER ECONOMIC IMPACTS OF TRANSPORTATION INFRASTRUCTURE

Task Force 3

INFRASTRUCTURE INVESTMENT AND FINANCING

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موجز السياسة

الآثار الاقتصادية الأوسع لبنية النقل الأساسية

فريق العمل الثالث

الاستثمار في البنية الأساسية وتمويلها

المؤلفون

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ABSTRACT

This proposal adopts a holistic approach to strategic transport investment by discussing the wider economic impacts (WEIs) analysis method in terms of several dominant and emerging methods. The WEIs analysis goes beyond the effects captured in a standard cost-benefit analysis (CBA). A CBA addresses the market for transport services and infrastructure access but neglects the wider impacts on other markets. These wider impacts usually relate to agglomeration, market power, and the behavioral adaptions of firms and households. The high uncertainty in land use changes indicates that WEIs tend to occur in different forms on multiple spatial scales, varying by place and time. Additionally, some activities, such as education, have no direct market value, but may indirectly contribute to the overall economic output and human capital development in cities and regions. Given that the conventional elasticity methods are not goal oriented, it is important to ensure that the WEIs analysis accounts for the stakeholder-specific costs and benefits.

Assuming that it is possible to consider all WEIs through theoretical models, major efforts should focus on establishing and maintaining appropriate methodologies and tools. The social and environmental data needed to address biodiversity issues should also be improved and promoted.

Complementary to the WEIs, understanding how the behavior of agents changes in response to the new transport options will help clarify the long-term implications of transportation. This will suggest new strategies (territorial appropriation), approaches/techniques to feasibility, and “place-based” interrelations, that is, specific interrelations in places. This last aspect is especially important in the current context of the COVID-19 pandemic, which has affected and will likely change transportation behaviors and transport demand in the dynamic future.

ABSTRACT

يتبنى هذا العرض نهجًا شموليًا للاستثمار في النقل الاستراتيجي من خلال مناقشة الطريقة التحليلية للآثار الاقتصادية الأوسع فيما يتعلق بالطرق العديدة الرئيسية والناشئة. وتتجاوز طريقة تحليل الآثار الاقتصادية الأوسع الآثار التي يتم رصدها في الطريقة القياسية لتحليل التكلفة والعائد. يستهدف تحليل التكلفة والعائد السوق من حيث خدمات النقل والوصول إلى البنية الأساسية، ولكنه يتجاهل الآثار الأوسع على الأسواق الأخرى. وعادةً ما ترتبط هذه الآثار الأوسع بالدمج وقوة السوق والتكيفات السلوكية للشركات والأسر. يُشير عدم اليقين المرتفع في تغيرات استخدام الأراضي إلى أن الآثار الاقتصادية الأوسع كثيرًا ما تحدث بأشكال مختلفة على نطاقات مكانية، وتتباين حسب المكان والوقت. وعلاوة على ذلك، فإن بعض الأنشطة، كالتعليم، غير ذات قيمة سوقية مباشرة، ولكنها قد تساهم بشكلٍ غير مباشر في المُخرج الاقتصادي الكلي وتطوير رأس المال البشري في المُدن والأقاليم. وبالنظر إلى أن الطُرق المرنة التقليدية ليست موجهة الهدف، فإنه من الأهمية بمكان التأكد من أن تحليل الآثار الاقتصادية الأوسع يحسب حساب التكاليف والمنافع الخاصة بأصحاب المصلحة.

بفرض إمكانية مراعاة جميع الآثار الاقتصادية الأوسع عبر النماذج النظرية، فينبغي للجهود الرئيسية التركيز على إرساء منهجيات وأدوات مناسبة والمحافظة عليها. كما ينبغي تحسين البيانات الاجتماعية والبيئية، اللازمة لمعالجة مسائل التنوع البيولوجي، وتعزيزها.

بالتكامل مع الآثار الاقتصادية الأوسع، فإن فهم مدى تغير سلوك العوامل في التجاوب مع خيارات النقل الجديدة سيساعد على توضيح تأثيرات النقل طويلة الأجل. ولسوف يقترح ذلك استراتيجيات جديدة (تخصيص المناطق)، ونُهُج/أساليب للجدوى، وعلاقات متبادلة "أساسها المكان"، أي تفعيل علاقات متبادلة محددة. وينطوي هذا الجانب الأخير على أهمية خاصة في السياق الحالي لجائحة كوفيد-١٩ التي أثرت ويُحتمل أن تغير سلوكيات النقل والطلب على المواصلات في المستقبل دائم التغير.

CHALLENGE

Investments in transport infrastructure are expensive from both the economic and environmental perspective. However, they also promote local economic development and growth, as well as national and international exchanges. Thus, we must identify the real benefits of transport infrastructure for specific stakeholders, activities, and locations. While CBA is still the prevailing methodology used to evaluate the usefulness of transport investments, WEIs studies (Chen and Hall 2012) are gaining greater attention.

The WEIs of transport infrastructure refer to the welfare impacts of the non-transport market. Despite an increasing number of projects aiming for economic growth and transformation, the ability of transport infrastructure to change economic fortunes is a core subject of debate (Chen and Vickerman 2017). A WEIs analysis goes beyond the standard CBA as it includes the effects related to agglomeration and market power, as well as behavioral adaptations by firms and households.

A WEIs analysis can have a considerable influence on the results of a transport appraisal. The initial economic appraisal of the London CrossRail project considered mainly the direct transportation effects in terms of the transit time and comfort of travelers. This led to a low benefit-cost ratio (BCR) and failed to justify the investment. However, work by Buchanan and Voltera Consulting suggested that the economic impacts of Crossrail on business productivity were both very large and entirely additional to the transportation impacts. The WEIs analysis thus had a significant impact on the decision-making that led to the approval of Crossrail projects with a high BCR. As wider economic benefits have not been usually considered, the UK's transport infrastructure has been largely underinvested, in particular rail infrastructure (Buchanan 2007).

The COVID-19 crisis challenges existing trends, thinking, and understanding. For instance, the role of public transport, type of transport modes used, competition between modes, new ways of working, travelers' behaviors, and transport demand.

WEIs will be even more important, as we can reasonably expect that travelers will move away from public transport, a factor for contagion risk. Governments may need to invest in higher capacity and higher quality public transport to ensure that passengers can follow certain social-distancing rules to reduce the fear and risk of taking public transport. WEIs are crucial to support these non-road projects. Projects that reduce congestion in public transport should generate gains in decongestion, which in a post-COVID-19 world, should be higher than before the outbreak. In urban contexts,

the evaluation framework should account for new, more environmentally friendly individual transportation modes. For example, bicycles, Segways, and electric scooters, among others, and their link with local public transportation.

The COVID-19 crisis also revealed the major challenges linked to freight transport. Thus, assessments of interregional/international projects should include wider elements regarding logistical times, which are poorly analyzed and insufficiently represented in the existing literature.

However, the WEIs approach has several limitations:

- Many WEIs are attributed to agglomeration productivity effects (Graham 2007; Venables 2007), which are difficult to observe and quantify.

- In terms of changes in land use, WEIs are very stochastic in their occurrence and magnitude. They tend to occur in different forms on multiple spatial scales, varying by place and time (Chen 2014).

- WEIs are considered only for some projects to justify their economic viability. This can lead to an unfair assessment of competing projects at different locations. One example is the impact of the transport infrastructure on agglomeration economies that could be instrumental in justifying infrastructures projects in large metropolitan areas. However, difficulties were encountered in estimating the impact of inter-urban and inter-regional transport projects, such as high-speed rail. Additionally, there are limits to the growth of agglomerations and to the desirability of agglomeration effects. This could be due to market imperfections. For example, if the households' gains from the agglomeration effects (mainly higher wages and perceived benefits of urban living) do not compensate for the costs to live in an agglomeration (e.g. rent, commuting time). Another aspect to consider is spatial equity: if the economic growth of one region is linked to brain drain and backwash effects in other regions, then the investment could endanger the social coherence of a region overall.

- As many studies demonstrate (Eliasson and Fosgerau 2019), there is a real risk to "double count" the benefits of transport projects when mobilizing WEIs. In particular, some of the improvements linked to better matching in the job market (#2 and #3) are likely to appear within classical changes in consumer surplus calculated in the standard CBA.

- When estimating the WEIs linked to agglomeration economies, it is important to differentiate the size and qualitative impact on employment and the nature of the firms. Charnoz, Charnoz, and Trevien (2018) find that changes in transport costs may impact the internal organization of firms with multiple sites across the agglomeration (which generate substantial jobs). The associated decrease in communication costs thus leads to increased concentration of management (production) jobs in headquarters (affiliates). Recognizing that management and employees do not have the same levels of productivity, applying the WEI recommendations will lead to erroneous predictions, especially from the spatial perspective.

- There is considerable asymmetry between most empirical evidence on agglomeration economies and its effects on the job market dynamics, while there is little empirical work on imperfect competition. The current practice (applying one exogenous decrease in the mark-up) lacks empirical support and clearly needs further research. This WEIs analysis may be of prime interest for sectors characterized by low competition and for other locations, such as mountains or coastal areas.

- WEIs amplify a central problem connected to CBA; that is, the CBA disregards relevant non-economic decision criteria. Thus, policymakers should consider the WEIs in addition to the underlying CBA and the connection between the CBA and Multiple Criteria Analyses (MCA), in particular, social and regional cohesion.

PROPOSAL

Toward wider and longer-term economic impacts

Decision makers should consider other indirect impacts of transport projects. These co-effects are less economic and short-term than the conventional WEIs, but may be of primary interest, especially to civil society, which would like to be informed about these dimensions:

- Some amenities provide no direct market value, but may indirectly contribute to the overall economic output of cities and regions. For example, the effect of public libraries on human capital, hospitals on life expectancy, and outside sports on job productivity.

- By changing residents' relative accessibility to these amenities, transport projects could thus indirectly affect the indicators above in the mid- to long- term.

- It may be possible to use the elasticities proposed in the literature to estimate wider and longer-term economic impacts. As a topical example, we can assess 1) the elasticity of individuals' earnings with respect to education level with 2) the elasticity of education with respect to the frequency of visits to a public library with 3) the elasticity of visits to a public library with respect to its accessibility.

- Obviously, this kind of analysis requires intensive empirical studies to obtain the proper elasticities, though it may be subject to similar limitations as the classical WEIs analysis, particularly double counting. However, there may be valuable outputs, especially for local residents.

An issue of reliable data

Assuming that it is possible to consider all WEIs and markets using analytical models, researchers will need to put forth remarkable efforts to establish a new methodology with appropriate tools. This is especially true in terms of obtaining reliable data, which are required to calibrate forecasting models. This is a notable challenge for models at fine-grained spatial and sectoral scales, which are sometimes necessary to cover distribution effects and thus to address the increasingly important question of equity.

A special focus on biodiversity

Infrastructure expansion can be a central mechanism for fostering economic growth and alleviating poverty. However, expanding infrastructure also causes great environmental harm (Laurance et al. 2015). While CBAs incorporated negative externalities (local air pollution, noise, CO_2 emissions) for many decades, the negative social and

economic impacts resulting from biodiversity and ecosystem loss still receive little consideration. However, policy tools to reconcile the development of road infrastructure and biodiversity have emerged. Among those tools, biodiversity offsetting policies and zero-deforestation requirements are increasingly encouraging development projects that aim for no net loss and ideally a net gain in biodiversity (zu Ermgassen et al. 2019; Jones et al. 2019). Although the changes in distributional equity resulting from ecological impacts and mitigation measures are concerning (Mandle, Tallis, Sotomayor, and Vogl 2015), the interest in the redistributive issue associated with these policies is also very recent (Griffiths, Bull, Baker, and Milner-Gulland 2019).

The evaluation, promotion, and funding of infrastructure projects should involve not only those who benefit from them, but also those who lose in the early stage of the planning process (Jones et al. 2019). There is a crucial need for a practical, applicable, and transparent method to define and assess the welfare effects of changes in biodiversity and ecosystem services related to infrastructure construction and maintenance (Bos and Ruijs 2019). This method should essentially consider the affected populations and access to nature for impacted communities (Taherzadeh and Howley 2018). An emerging research agenda requires collaboration among scientists, regulators, and developers to find options (including impact avoidance) that are economically, environmentally, and socially sustainable. Understanding how different stakeholders depend on and value biodiversity is key to assessing the social impacts of transport infrastructure. In this context, greater use of spatially-referenced social and environmental data (Ives et al. 2015) and greater engagement by local stakeholders must be improved and promoted.

Toward a holistic approach and a long-term transformative vision

Strategic planning and integrated interventions during the development process are indispensable for maximizing positive WEIs. Such awareness is well captured in the UK WebTAG. Empirical evidence demonstrates that proactive, strategic planning (for both transport and non-transport measures) with a supportive policy and governance structure could reduce regional inequality (Ampe 1995; Chen and Hall 2012; 2015).

Quantifying the benefits of engagement, which is neglected in the public sector, is a challenging task. The international literature contains very few evaluations of the costs and benefits of Stakeholder Engagement (SE). It is important to measure some costs and benefits of participatory activity in transport projects, and to show whether an economic measurement of SE could improve public decisions on transport system investments, thus providing a way forward.

With a holistic approach and a long-term transformative vision, there is an urgent need to more effectively disentangle the relationship between transport infrastructure and WEIs. This will develop innovative reforms in infrastructure financing/taxation policy and devolution, which can help address wider regional needs and garner support for mega infrastructure projects.

Ideally, WEIs should be considered when generating project ideas. In this way, the proposed projects can aim to foster economic welfare in all dimensions from the beginning stages. A WEIs analysis would then not only be necessary to justify the project plans but can also contribute to infrastructure projects that are economically sensible from a holistic point of view from the outset.

WEIs must integrate Territorial Appropriation (TeA) and New Feasibilities (NF)

A TeA analysis focuses on how territorial change processes occur, how socio-economic agents and local authorities appropriate the new transportation system, and how the transportation system and the territory mutually adjust to changes (Facchinetti-Mannone 2019).

Finally, the relevance of a new transportation mode/investment/service established in a territory should also be evaluated using an NF for activities/identities/attitudes/processes that were not feasible prior to the transportation project. Those that were already feasible but that are easier with the new transportation investment should not be prioritized (Ureña, Menerault, and Garmendia 2009). The latter will improve the territory, but the former will facilitate real new developments.

Of course, it is necessary to understand WEI, TeA, and NF to fully appreciate the relevance of a new envisaged transportation investment. From a long-term perspective, it is not only important for new transportation investments/services in a territory to accompany or induce new activities. What remains in the area (region, city, etc.) when the novelty of the new transportation investment disappears is equally important (Coronado, Ureña, and Miralles 2009).

The WEIs analysis clarifies what wider activities benefit from or are disturbed by the investment, the TeA indicates how the agents adapted to the new transport to suggest new strategies, and the NF clarifies the potential new feasibilities. Together, these analyses indicate the possible long-term implications of transportation, including the direct and indirect influences, the real gains and opportunities, and the improvements and NF, which contribute to future development.

Go beyond the wider economic effects of transport infrastructure: A place-based approach

A change in the causality sequence from transport infrastructure to local economic development is required.

The departure point of the analysis must be local economic development defined not only as economic growth but also social development, welfare, and relationships between stakeholders in a given place. Indeed, places and history matter. The interrelations between transport infrastructure and local economic development vary over time and in space. Following on from the work of Barca, McCann, and Rodríguez-Pose (2012), we could qualify these as "place-based" interrelations because they depend on local characteristics, strategies, and policies. Moreover, we must go beyond the narrow and numerical analysis of transport infrastructure to analyze the services associated with the instrumental aspects of infrastructure, such as the number of trips from a rail station, number of flights to and from an airport, and the types of origin and destination, among others.

The twenty-first century is characterized by the current and future extension of the infrastructure networks in developing countries, which have very different socio-economic contexts from Europe. Thus, a place-based approach is even more critical. However, how can we analyze these interrelations better? Such an analysis should integrate different elements and a multi-scalar approach, such as:

- The many domestic and external elements that affect the use of transport infrastructure (environmental, security, health, economic climate, etc.), as it is well known that the economic climate affects the use of transport infrastructure. The current COVID-19 pandemic demonstrates how transportation is also linked to the international health context.

- The national elements that affect the use of transport infrastructure (culture, economic climate, social, environmental, urban structure, etc.), as well as the provider of the national strategy.

- The local characteristics that affect the use of a transport infrastructure, including

    - o the provider's strategy in terms of services linked to the infrastructure,

- o the local economic dynamics, sectoral specialization, types of firms (industrial or services, large or small),
- o the geographical and historical characteristics of the city (location, environmental amenities, etc.),
- o the structure of the population (age, qualifications, socio-professional categories) that will use and appropriate the transport infrastructure, and
- o the accompanying strategies linked to transport, especially the quality of inter-modality, the link to other areas such as tourism, attractiveness, and the coordination of these strategies between local stakeholders.

This proposal suggests a holistic approach, including a multi-scalar analysis (MSA) and weighted multi-criteria analysis (WMCA). However, analyzing these elements requires an understanding of the coproduction of these interrelations and looking beyond the “wider economic effects” of transport infrastructure.

Disclaimer

This policy brief was developed and written by the authors and has undergone a peer review process. The views and opinions expressed in this policy brief are those of the authors and do not necessarily reflect the official policy or position of the authors' organizations or the T20 Secretariat.

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