

# PPP projects in transport: evidence from light rail projects in Spain

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## *Abstract*

Public-private partnerships (PPPs) have been extensively used in Spain for the procurement of light rail systems. This article analyses the five projects that have been in operation for more than five years. It examines the public sector's rationale behind the selection of these PPP projects, risk sharing mechanisms, competition among private providers, and overall cost effectiveness of the investments. The research illustrates the need for more rigorous ex-ante assessments of the merits of PPP projects before they are initiated.

*Key-words: Public-private partnerships, light railways, risk sharing, competition, Spain.*

## **1. Introduction**

The past decades have witnessed a proliferation of public-private partnerships (PPPs) as a means of delivering various types of infrastructure services. While this development is well documented in the Anglo-Saxon context, PPPs are now to an increasing extent being implemented in other European countries as well. Particularly in debt-ridden countries in southern Europe, private investments through the PPP route are often seen as one of the primary ways of raising project finance in the current fiscal situation. This is not least the case in Spain, where recent figures from the European PPP Expertise Centre document that the capital value of signed PPP deals in 2010 was the highest among all the EU countries (European PPP Expertise Centre, 2011).

In contrast to the UK, though, where PPPs have been utilised across a broad span of sectors, PPPs in Spain have so far mainly been implemented in the transport sector. In particular, Spanish regional and local authorities have utilised the PPP model as a means of procuring light railway systems in major cities such as Madrid and Barcelona. The proliferation of light rail projects in Spain follows a tendency that is common not only in other European countries but also in other parts of the world (Chen and Fang, 2011). Consequently, almost half of the fifteen light rail projects that have been implemented to date in Spain have been Build-Operate-Transfer (BOT) concessions representing a capital value of approximately € 2.7 billion.

In this article, we provide a detailed assessment of the experiences gained with the five large-scale BOT light railway projects in Spain that have been in operation for more than five years (three projects in Madrid and two in Barcelona). All five projects were awarded by regional governments (of Madrid and Catalonia, respectively) between 2000 and 2006 (see Table 1) with concessions signed for approximately 25 years in most cases. The article is, to the authors' knowledge, the first internationally published assessment of the utilisation of the BOT/PPP formula to build and operate light rail projects in the country. In addition to examining the public sector's rationale behind the selection of these PPP projects, the article examines the cases with reference to key PPP categories including the risk sharing mechanisms, competition among private providers, and overall cost effectiveness of the investments. Although Spanish in context, the findings have a broader international relevance

since this group of light railway projects represent roughly half of those that have been erected in the world so far through a BOT concession scheme.<sup>1</sup>

[Table 1 about here]

The analysis illustrates that from the point of view of building the infrastructure and providing the service, the experience of these five concessions may be considered a success. Roughly 65 km of light rail lines were built in seven years by these two regional governments in densely populated areas with a total investment of €1,339 million. At the same time, though, the article illustrates that political opportunism was determining the selection of projects at the same time as demand forecast in almost all projects was not high enough to justify building a light rail. In three out of five concessions, there was no real competition in the bidding process, and in most cases the public sector retained a substantial part of the demand risk. Overall, the evidence base suggests that it is dubious whether economic efficiency and value for money have been achieved in these five large-scale BOT projects. Furthermore, the evidence provided in this article illustrates the need for more rigorous ex-ante assessments of the merits of PPP projects to insure that taxpayers' interests are adequately considered under such schemes.

## **2. Framework for analysing PPP experience**

Among proponents of the PPP model, the case for private finance through the PPP route is generally made on the basis that these types of projects can potentially speed up the delivery of infrastructure, circumvent constraints on public spending and provide better value for money compared to traditional procurement methods (Grimsey and Lewis, 2007; Akbiyikli et al., 2011). Recently, however, a growing number of academic studies have questioned the rationale, risk sharing structure and economic performance of PFIs and PPPs. Concerns have in particular addressed governments' lack of proper assessment of the costs of private finance and thus the long-term liabilities of these capital-intensive projects. Furthermore, many experts now recognise that private finance obtained through the PPP route does not in itself provide additional investment opportunities in addition to what could otherwise have been provided because in the long run there is always a bill to be paid by the taxpayers or users (Hodge and Greve, 2009; Shaoul *et al*, 2010).

Despite the growing focus on the performance of PPPs in general and transport PPPs in particular, detailed assessments of experiences with PPPs in light railway are scarce. Previous literature on light railways has focused on the comparison between costs and benefits of this kind of investments (e.g. Litman, 2006; Guerra, 2011; Prud'homme et al., 2011). Other authors have analysed one or more cases focusing on the lessons made with these projects from the point of view of building and operating a light rail project (Priemus and Konings, 2001; De Bruijn and Veeneman, 2009).

In the broader context of evaluating the merits of PPPs within transport, the empirical evidence illustrates that the PPP route does not in itself guarantee against cost overruns and

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<sup>1</sup> As of 2012 only two other projects have been in operation for some years (Manchester Metrolink and Rouen Tramway). Four others have entered in operation only recently (Reims, Florence, Jerusalem and 'Rhônexpress' in Lyon). Another project was under construction as of 2012 (South Africa), and other projects have been taken over by the government a few years after entering in operation (such as Kuala Lumpur and Croydon Tramlink).

inadequate risk sharing mechanisms (Hodge, 2004; Siemiatycki, 2006). In an evaluation of the experiences with the PPP model for toll roads in Spain, Acerete, Shaoul and Stafford (2009: 19) conclude that the cost of private finance is nearly double compared to the cost of public finance for comparable projects. Other studies illustrate a lack of public accountability in many PPP projects and conclude that it is dubious whether projects have provided cost-effective solutions compared to traditional procurement methods (Edwards et al., 2004; Shaoul et al., 2006).

Transfer and sharing of risks are perhaps the most disputed features in assessments of economic efficiency and accountability of contemporary PPPs (Pollock et al., 2007). Mainstream PPP theory states that risks should be transferred according to principle that each risk should be handled by the partner best suited to manage and control the particular risk (Grimsey and Lewis, 2002). In a study of PPPs in the Netherlands, Van Ham and Koppenjan (2002) notes that partnership success was, among other things, challenged by an insufficient risk sharing framework. Empirical evidence from other projects suggests that this is not always accomplished, though, with evidence suggesting that governments might end up with responsibility for more risks than originally anticipated at the time of contract agreement (Hodge, 2004).

Yet, another key theme in the evaluation of PPP is the preparation of tender documents to ensure sufficient competition between private bidders. In the EU countries, the procurement of projects is regulated by the Procurement Directive, which is designed to ensure that private bidders are treated on a fair and equal basis, but also to ensure that the public sector receives the most economically advantageous tenders (Petersen, 2010). Achieving a sufficient competition for PPP deals is thus considered in most literature as a prerequisite for achieving the most economically advantageous tender (Pina and Torres, 2006). Evaluations of the working of procurement procedures like the competitive dialogue procedure and the optimal amount of bidders for projects are, however, generally lacking, as noted by Zitron (2006).

The research conducted for this article aims to broaden the evidence base regarding the lessons learnt with transport PPPs in Spain in general and with PPP within light railways in particular. We examine the five BOT light railway projects with respect to key PPP issues, including the selection of projects, risk sharing/allocation, competition, and overall cost-effectiveness of the investments.

The article's empirical base consists of data collected through sixteen face-to-face interviews with public and private representatives of the stakeholders participating in the five PPP schemes. Interviewees include government officials of the regional governments of Madrid and Catalonia, respectively, as well as private project managers of the concessionaires. Furthermore, interviews were also conducted with representatives of engineering companies and banks involved as financiers in the projects (a full list of interviews can be provided by contacting the authors). Finally, key information and data regarding the projects were also provided by the regional transport authorities responsible for the five schemes.

### **3. Rationale behind the selection of the projects**

The analysis illustrates that political opportunism, lack of ex-ante studies analysing the cost effectiveness of the investments and low demand forecast made the rationale for selecting projects questionable. According to the interviewed government officials and representatives of the private sector, in four out of the five projects (all but Trambaix, the first project) political opportunism played an important role in the decision of building the projects. In the cases of Pozuelo-Boadilla, Las Tablas and Parla, the projects were a promise made during the 2003 regional and local elections campaign. In the case of Trambessos, the light rail would connect Barcelona city centre with the headquarters of the Universal Forum of Cultures.

None of the projects underwent an ex-ante cost-benefit analysis. Furthermore, two out of the three projects in Madrid (Las Tablas and Parla) did not even appear in the documents of the urban planning process of the city. However, the other project in Madrid (Pozuelo) and the two projects in Barcelona (Trambaix and Trambessos) were envisaged in the planning documents.

Two of the concessions in Madrid have the particularity that they were awarded when they were already under construction. Pozuelo and Boadilla are two different lines that share a short section. They were granted as a single concession. The other one was Las Tablas. When these three projects were in the middle of the construction process, Eurostat (the EU agency in charge of auditing general government debt) changed the status of the public agency of Madrid regional government in charge of building these three projects (MINTRA). After that change, the accounts of this agency were placed on the balance of the Madrid regional government (before the change they were off-balance). As a consequence, the Madrid regional government decided to turn these projects into BOT concessions in order to avoid the increase in both public deficit and debt.

According to many of the representatives of the private sector, who were interviewed for the purposes of this article, the demand in almost all but one project (Trambaix) was not high enough to build a light rail system. According to many government officials and private sector interviewees, the minimum amounts of daily passengers in weekdays that justify building a light rail are between 35,000 and 50,000. Using this estimation as a way of analysing whether the projects had enough demand to be built, only Trambaix reaches this threshold, both in the forecast and in the real demand (see Table 2).

*[Table 2 about here]*

Moreover, the comparison between the actual demand and forecast in Pozuelo and Boadilla shows that the estimations provided by the public administration significantly overestimated passenger numbers (Table 2). As of 2011, actual demand in Pozuelo and Boadilla was roughly 50% of that forecast by the regional government, as shown in Table 2. Some observers from the private sector claim that the Madrid regional government overstated the demand estimations because this was considered necessary in order to turn these three projects (Pozuelo, Boadilla and Las Tablas) into BOT concessions and thus avoid the increase in the deficit and debt of the Madrid regional government.

An alternative way of examining whether the demand was high enough to justify building a light railway is to compare the demand forecast with the investment costs. A standard way of

doing so is to calculate the number of daily passengers divided by the investment costs. According to Carmona (2012), the minimum number of daily passengers in weekdays related to the investment (in million Euros) should be 150 to justify building a light railway (the number 150 is, admittedly, a rough estimate that could be further examined in future research).

As shown in Table 3(column 5) only one project (Trambaix) can in fact display enough demand to justify a light rail system. Another project (Parla) is close to that threshold. But two concessions are very far from this threshold (Pozuelo-Boadilla and Las Tablas). In these two projects the demand was low and the investment cost very high, especially one of them (Las Tablas) because 60% of the route was built underground. The interviews with public officials illustrate that the decision to place parts of the light rail track underground was taken for political reasons in order to avoid protests from neighbours that were against the construction of a rail track over ground adjacent to a residential area.

*[Table 3 about here]*

#### **4. Competition for the projects**

With regard to the competition among private providers, our analysis shows that in three out of the five concessions, there was little or no competition in the bidding process. Hence, only two projects (Trambaix and Parla) were characterised by real competition for the concessions with four bidders submitting tenders (see Table 4). In the other three concessions there was only one real bidder and thus an absence of competition for the contract.

*[Table 4 about here]*

In the case of Trambessos, the public administration of Barcelona only received a single bid, which was submitted by the consortium that had already contracted the other existing light rail concession project in Barcelona (Trambaix). According to public government officials and private sector representatives interviewed in our research, the main reasons were: 1) The Barcelona public agency in charge of awarding and managing the concession trusted this consortium; 2) This consortium had already the expertise of building and managing a light rail system (by that time very few companies in Spain had that expertise); 3) The public administration provided a short period of time from launching the bid to the deadline for submitting bids (only four months). The reason for speeding up the process of awarding this second concession was the need to inaugurate the Universal Forum of Cultures, a major worldwide event held in Barcelona in May 2004. In practice, only concessionaire was able to prepare a proper bid on such short notice: the consortium that had won the previous BOT concession in the city.

In the case of the Las Tablas project there was also one bidder only. In this project, the main reason was that the terms of reference of the concession tender required that the operator company had to share the tram depot with Metro de Madrid (the public company of Madrid regional government in charge of operating the Madrid subway). As a result of these conditions, the only company that submitted a bid for the project was a consortium led by Metro de Madrid.

In the case of the concession Pozuelo-Boadilla the situation was somewhat different. According to both government officials and representatives from the private sector, one of the two bidders in this tender had to be 'invited' by the public administration in order to avoid receiving only one bid. One of the consortia was led by the construction company that was already building the project. And it seemed quite obvious that this consortium was going to win the tender, which also turned out to be the case when the concession was awarded. All in all, the evidence thus illustrates that the competition for the concessions was either low or not existent in the five projects.

## **5. Risk allocation**

The examination of risk transfer in the five cases is carried out with reference to four key PPP risk categories: construction, demand, operation and availability risk. The analysis illustrates that in all five concessions the public sector has in principle transferred all four types of risks to the private concessionaire. However, the empirical material also illustrates that particularly demand risk has directly or indirectly been mitigated in all five projects.

Our analysis shows that construction risk has been transferred from the public administration to the concessionaires. Four out of five projects experienced significant cost overruns (around 15-20%): Parla, Pozuelo-Boadilla, Trambaix and Trambessos. In most cases, the main cause for cost overruns was changes in the projects made by the public administration. These cost overruns were caused by various requirements of stakeholders affected by the projects including local governments, neighbours, etc., which led to the development of a more complex project than initially envisaged in the planning documents. These changes in the original design of the concessions were accepted by the regional government and the resulting cost overruns were thus assumed by the public administration. In addition, there were also minor cost overruns because of deficiencies in the projects, mostly related to lack of identification of the public services affected (such as electricity, telephone and gas). But these additional costs were not assumed by the public administration.

Scrutinising the distribution of operation risks, these risks were in all five cases transferred from the public administration to the concessionaires. In the case of Trambaix, Trambessos and Las Tablas operation risks were furthermore transferred downwards from the concessionaires to an operator company, while in the case of the other two concessions (Pozuelo-Boadilla and Parla) operation risks were retained by the concessionaires.

In addition, availability risk has been transferred from the public administration to the concessionaires. In all five concessions the concessionaire's revenue is reduced in case of breakdown or lack of availability of the infrastructure, but in all cases the penalties are rather small in relation to events that are not unusual in the functioning of public infrastructure, such as delays due to lack of punctuality.

However, our analysis shows that demand risk has directly or indirectly been mitigated in all five projects (see Table 5). Two projects (Pozuelo-Boadilla and Las Tablas) have a minimum income guarantee. It assures the concessionaires 68% of the total income that corresponds to the demand forecast made by them in the concession bid. The minimum income guarantee

has been activated in Pozuelo-Boadilla from the beginning. In Las Tablas it has not been necessary because demand has in fact been higher than forecast by the concessionaire. In two other projects (Trambaix<sup>2</sup> and Trambessos) the revenue of the concessionaire are not proportional to the demand but have been established according to strips in a way that reduces the demand risk transferred to the concessionaire. Hence, if the demand reaches 52% of the forecast by the concessionaire, the concessionaire receives roughly 82% of the total forecast income. If the demand reaches 80% of the forecast, the concessionaire receives roughly 97% of the total forecast income. In the case of Parla, the demand risk was assumed by the government during the five first years of operation, which removed all demand risks from the private partner for this period.

*[Table 5 about here]*

## **6. Were the investments cost-effective?**

Our analysis illustrates that it is dubious whether economic efficiency and value for money have actually been achieved in these five concessions for light railways. The public sector did not carry out ex-ante cost-benefit analysis nor analysed whether these projects would provide value for money. Carrying out a full cost-benefit or value for money analysis, though, is beyond the scope of this article. In order to provide a basic analysis of the cost-effectiveness of these five projects, we use as a proxy a calculation of the total cost per user paid by the government and a basic qualitative analysis of the main socioeconomic benefits of the projects. As of 2012, it was too early to evaluate the full socioeconomic benefits of these projects since they were still in the first years of operation and the concession period lasts around 25 years. Our analysis is therefore a first and preliminary attempt to examine whether the investments were cost-effective. It shows that arguably two of the concessions (Pozuelo-Boadilla and Las Tablas) have a very low cost-effectiveness.

In our analysis, we estimated the total cost per user paid including all public contributions. To be able to do this, we included both the tariff paid by the government (called 'Technical tariff') and the proportional cost per user derived from the direct public contribution for the initial investment. The tariffs per user paid by the government to the concessionaire are shown in Table 7 (first line). This tariff is very high for Pozuelo-Boadilla and Las Tablas because these projects received no direct contribution from the regional government for the initial investment. However, the other three projects had a substantial direct contribution to pay for the initial investment.

In order to estimate the proportional cost per user derived from the direct public contribution for the initial investment, we first calculated the total direct public contributions for the initial investment (see Table 6). With that information, we estimated what the direct public

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<sup>2</sup> In the case of Trambaix, this was not the original way to pay to the concessionaire that had been established in the concession contract. It was changed in 2008 because of a renegotiation of the contract, only four years after entering into operation. Basically, the way the concessionaire is paid was made similar to the one established in the contract for the Trambessos concession that had been recently awarded to the same concessionaire. This new system is more favourable to the concessionaire if the demand does not exceed the demand forecast by the concessionaire, but is more favourable to the government if the demand exceeds the demand forecast by the concessionaire. Anyway, the government had to compensate to the concessionaire because it failed in cancelling some bus lines that are a competition for the light rail and that were planned to be cancelled.

contribution for investment would be if it was translated into an additional tariff per user (see Table 7, line 2).

As shown in Table 7, the total cost per user including all public contributions is significantly higher in the case of Pozuelo-Boadilla and Las Tablas than in the other three projects.

*[Table 6 and 7 about here]*

Regarding the main socioeconomic benefits of the projects, a basic qualitative analysis shows that two of the concessions (Pozuelo-Boadilla and Las Tablas) seem not to have provided significant socioeconomic benefits. According to a number of authors including Topalovic et al. (2012), De Bruijn and Veeneman (2009), and Litman (2006), relevant socioeconomic benefits of light rail projects include: 1) Reduction in traffic congestion; 2) Stimulation of economic development; 3) Change in land use; 4) Urban growth; 5) Improving mobility; 6) Improving accessibility.

In the interviews we conducted for this research, we asked about the main possible socioeconomic benefits of the projects in order to check whether the mentioned positive impacts had been achieved or not. In Table 8 we have summarised the results of this qualitative analysis. The main conclusion is that Trambaix, Trambessos and Parla have some relevant socioeconomic benefits such as reducing traffic congestion, improving accessibility and changes in land use. In the case of Pozuelo-Boadilla and Las Tablas there is not, however, almost any relevant socioeconomic benefit.

*[Table 8 about here]*

## **7. Conclusions**

The regional governments of Madrid and Barcelona achieved the objective of building five major light rail projects using a BOT formula. In our research, however, we found significant deficiencies in the implementation of most of these BOT concessions. The analysis shows that demand forecast in most cases was not high enough to justify building a light rail, and that in the majority of projects political opportunism played an important role in the decision to erect them. We also found that there was very little or no competition in the bidding process, and that the public sector retained a substantial part of the demand risk.

Our analysis also illustrates that it is dubious whether economic efficiency and value for money has actually been achieved in these concessions for light railways. The public sector did not carry out careful cost-benefit analysis nor analysed whether these projects provide value for money. A basic analysis of economic efficiency showed that from the perspective of users and tax payers at least two of the projects seem to have provided a very low cost-effectiveness.

Overall, the article thus illustrates that because of political opportunism and too optimistic demand forecasts, the BOT formula has in some instances been utilised to implement projects with a low cost-effectiveness. Obviously, the financial crisis may have contributed to lower passenger numbers than originally anticipated, but with demand forecast twice the size of

actual daily passenger numbers in two of the five projects, the crisis hardly carries the full responsibility for the optimistic demand forecasts in the ex-ante phase.

All in all, the empirical evidence from the five light railway projects in Spain contributes to make a stronger case for the need of rigorous ex-ante assessments of the merits of PPP projects before they are initiated. Such assessments could include a comparison of financing costs and total project costs against a public sector comparator and the utilisation of more accurate risk assessment tools and risk sharing mechanisms to ensure value for money of the investments made under various BOT and PPP schemes, as also highlighted by previous research (e.g. Acerete, Shaoul and Stafford, 2009; Siemiatycki, 2010).

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**Table 1: Characteristics of the five BOT concessions for light rail systems in Spain**

City	Year of	Year	Invest	Length	%	#	Passg.
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		award	entering in operation	ment (M€)	(km)	underground	stops	(mill) 2011
Trambaix	Barcelona	2000	1 <sup>st</sup> : 2004; 3 <sup>rd</sup> : 2007	230	15.8	9,5%	29	16.1
Trambessos	Barcelona	2002	1 <sup>st</sup> : 2004; 5 <sup>rd</sup> : 2008	205	14.1	0%	27	8.0
Parla	Parla (Madrid)	2005	2007	128	8.2	0%	15	5.0
Pozuelo-Boadilla	Madrid	2006	2007	522	22.4	0%	29	7.5
Las Tablas	Madrid	2006	2007	254	5.4	68.5%	9	4.9

Source: Elaborated by the authors with data provided by Consorcio Regional de Transportes de Madrid (CRTM) (Regional Agency for Transport in Madrid), Autoritat del Transport Metropolità (ATM) (Regional Agency for Transport in Barcelona) and the concessionaires.

**Table 2: Estimated and actual demand (forecast by the public administration), daily passengers in weekdays**

	Trambaix		Trambessos		Pozuelo		Boadilla		Las Tablas		Parla	
	Estimated	Real	Estimated	Real	Estimated	Real	Estimated	Real	Estimated	Real	Estimated	Real
2004	40.740	25.044	0	0	0	0	0	0	0	0	n.a.	0
2005	47.846	34.414	27.875	8.035	0	0	0	0	0	0	n.a.	0
2006	54.084	43.872	28.844	12.100	0	0	0	0	0	0	n.a.	0
2007	54.952	48.149	29.844	20.040	28.939	0	22.275	0	16.395	0	n.a.	0
2008	55.691	52.859	30.875	23.189	29.796	13.878	23.137	13.725	18.026	17.597	n.a.	13.704
2009	53.312	55.544	31.969	24.024	30.694	15.102	24.078	14.510	19.442	21.030	n.a.	15.556
2010	53.183	53.548	33.063	29.922	31.592	15.102	25.020	14.510	20.601	21.030	n.a.	17.778
2011	51.768	54.814	34.125	25.411	32.571	15.510	26.039	14.510	21.845	21.030	n.a.	18.519

Source: Elaborated by the authors with data provided by Consorcio Regional de Transportes de Madrid (CRTM) (Regional Agency for Transport in Madrid), Autoritat del Transport Metropolità (ATM) (Regional Agency for Transport in Barcelona).

**Table 3: Comparative analysis of investment cost**

	(1) Investment million €	(2) km	(3) Million €/km	(4) Avgdaily passengers in weekdays, 2011	(5) Avgdaily passengers in weekdays, 2011 (mill. €)
Trambaix	230	15.8	14.6	54,814	238,3
Trambessos	205	14.1	14.5	25,411	124,0
Parla	128	8.2	15.6	18,500	144,5
Pozuelo-Boadilla	522	22.4	23.3	29,964	57,4
Las Tablas	254	5.4	47.0	21,026	82,8

Source: Elaborated by the authors with data provided by Consorcio Regional de Transportes de Madrid (CRTM) (Regional Agency for Transport in Madrid), Autoritat del Transport Metropolità (ATM) (Regional Agency for Transport in Barcelona).

**Table 4: Number of bids**

Project	Number of bids
Trambaix	4
Trambessos	1
Pozuelo-Boadilla	2
Las Tablas	1
Parla	4

Source: Elaborated by the authors with data provided by Consorcio Regional de Transportes de Madrid (CRTM) (Regional Agency for Transport in Madrid), Autoritat del Transport Metropolità (ATM) (Regional Agency for Transport in Barcelona).

**Table 5: Concessionaire's revenues**

	Revenue	Minimum income guarantee (MIG)	
Trambaix	Technical tariff x number of pass. (1)	There is no MIG but a system of bands that works in practice as a MIG (2)	
Trambessos	Technical tariff x number of pass. (1)	There is no MIG but a system of bands that works in practice as a MIG (2)	
Pozuelo-Boadilla	Technical tariff x number of pass. (1)	68% of demand forecast by the concessionaire	MIG activated from the beginning
Las Tablas	Technical tariff x number of pass. (1)	68% of demand forecast by the concessionaire	MIG not activated because of enough demand
Parla	CI + technical tariff x number of pass. (3)	There is no MIG (4)	

(1) 'Technical Tariff' is the tariff paid by the regional government for each user.

(2) If the demand reaches 52% of that forecast by the concessionaire, it receives roughly 82% of total forecast income. If the demand reaches 80% of that forecast by the concessionaire, it receives roughly 97% of total forecasted income.

(3) CI means 'Contribution for Investment', which is the annual amount that the concessionaire receives to cover for the investment. This amount is offered by the concessionaire in the bid.

(4) It is important to note, however, that a relevant part of the annual concessionaire's payment does not depend on the demand but on the investment. In addition, during the five first years of operation, the part that depends on the demand was substituted by a payment depending on the number of vehicle x km.

Source: Elaborated by the authors with data provided by Consorcio Regional de Transportes de Madrid (CRTM) (Regional Agency for Transport in Madrid), Autoritat del Transport Metropolità (ATM) (Regional Agency for Transport in Barcelona)

**Table 6: Direct public contribution for the investment (in million Euros)**

	Trambaix	Trambessos	Pozuelo-Boadilla	Las Tablas	Parla
Initial contribution	0	0	0	0	44
Contribution paid in fixed annuities (total amount)	228.7	196.0	0	0	80
Contribution paid in variable annuities (total amount)	72.2	67.7	0	0	0
Total direct public contribution for investment	300.9	263.7	0	0	124

Source: Elaborated by the authors with data provided by Consorcio Regional de Transportes de Madrid (CRTM) (Regional Agency for Transport in Madrid), Autoritat del Transport Metropolità (ATM) (Regional Agency for Transport in Barcelona) and the concessionaires.

**Table 7: Total payment per user including all public contributions in 2011 (in Euros)**

	Trambaix	Trambessos	Pozuelo-Boadilla	Las Tablas	Parla
Technical tariff	0.51	0.46	5.35	4.81	1.05
Direct public contribution for investment (1)	1.35	1.77	0	0	0.42
<b>Total</b>	<b>1.86</b>	<b>2.23</b>	<b>5.35</b>	<b>4.81</b>	<b>1.47</b>

(1) This component has been calculated as the annual amount paid in 2011 as direct public contribution for the investment divided by the number of passengers in 2011.

Source: Elaborated by the authors with data provided by Consorcio Regional de Transportes de Madrid (CRTM) (*Regional Agency for Transport in Madrid*), Autoritat del Transport Metropolità (ATM) (*Regional Agency for Transport in Barcelona*) and the concessionaires.

**Table 8: Qualitative analysis of the socioeconomic benefits of the projects**

	Trambaix	Trambessos	Pozuelo-Boadilla	Las Tablas	Parla
Reduction in traffic congestion	x				x
Stimulation of economic development	x	x			x
Change in land use		x			x
Urban growth		x			x
Improving mobility	x				x
Improving accessibility	x	x	x	x	x

Source: Elaborated by the authors