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Private provision of public goods and political survival: Rail transport in four European democracies in the 20th century

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ABSTRACT

The provision of public goods plays a key role in the survival of leaders in democracies. Assuming that mass rail transport shares many of the characteristics of public goods, we claim that the public provision of railway services is more beneficial for political leaders in democracies than private provision. To estimate the effect of the type of provision of railway services on leader survival, we use new data on four European democracies that present variation in the public and private ownership of rail miles between 1913 and 1981. We find that the private provision of rail transport increases the hazard rates of leader deposition in these democracies. These results bear crucial implications, as they help to explain the sweeping policies of nationalization of public services that took place in the first half of the 20th Century in Western Europe.

1. Introduction

The regulation and provision of railroads are frequently addressed from an economic perspective to assess efficiency (e.g., Amaral, 2008; Bougna & Crozet, 2016; Waters, 2007). Yet, the provision of goods and services can also be crucial for political motives, namely to gain political support from citizens. While the majority of studies on leader survival agrees that democratic regimes generally tend to provide more public goods for reasons of political survival (see Bueno de Mesquita et al., 2003; Deacon, 2009; Lake & Baum, 2001; McGuire and Olson 1996), there is limited empirical evidence about particular types of goods provided and whether they can be associated with duration in office. Previous research uncovers a positive effect for some types of public goods in democracies such as economic growth, victory in war, or even air quality (see, e.g. Goemans, 2008; McGillivray & Smith, 2008; Flores & Alejandro, 2012 ; Clark et al., 2013).[1] Although democracies are also associated with a higher public good provision in infrastructure (Roessler, 2019; Bueno de Mesquita et al. 2003), the impact of the type of provision of infrastructural goods and services on political survival in democracies has not yet been scrutinized.

In this paper, we close this research gap and examine the effect of the share of privately-owned railway mileage on democratic leader survival. The provision of mass transport by the government is one of the infrastructure-related goods and services that should increase tenure in office (e.g., Bueno de Mesquita & Smith, 2009). Building upon previous theoretical work, we test whether the public provision of infrastructural goods like railways exerts a positive effect on political survival: due to its positive effect on an economy's productivity (McGuire and Olson 1996) and a citizen's level of consumption, it generates loyalty and political support of a large share of the population in exchange (Bueno De Mesquita et al. 2003; Deacon, 2009). Therefore, we expect a larger share of privately-owned railway infrastructure to increase the hazard rates of leaders in large coalition systems because it reduces the general welfare of supporters (e.g., Preston & Robins, 2013), thus fueling their incentives to replace the incumbent with a challenger.

We test our theoretical argument with a new sample of manually collected data of the ownership of rail transport in four European democracies between 1913 and 1981. This small sample is characterized by a large cross-country and within-country variation on how this 'public good' is provided.[2] For instance, in Germany, Austria, and

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[1] For a discussion on goods provision and authoritarian leader survival see, for instance, Lucas and Richter (2016).

[2] In line with previous literature (e.g., Roessler, 2019), we refer to public goods provision in infrastructure such as the publicly owned railway mileage as a 'public good'. It has to be noted, however, that the provision of mass transport is not a fully public good since it is somewhat excludable and congestible.

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Belgium, there have been both public and private companies operating at the same time, although across different lines. In France, the rail network has been a public-private hybrid for most of the 20th Century. Estimating duration models with a probit link, we find supporting evidence that the private provision of rail mileage increases leaders' hazard rates. This result is robust to the use of alternative rail mileage data from the late 19th Century (Bogart, 2009).

We contribute to earlier studies in several aspects. Using disaggregate data on railway mileage ownership, we provide the first systematic analysis of the effect of an additional aspect of 'public goods', i.e. infrastructure, on political survival. In doing so, we extend previous studies on the effect of particular goods on political survival (e.g., Bell, 2011; Clark et al., 2013; Quiroz Flores, 2012; Lucas and Richter, 2016). While the variation in ownership of rail networks has been explored by several researchers and numerous case studies (e.g., Bogart, 2009; Dougall, 1939; Kasraian et al., 2016; Millward, 1995; Veenendaal, 1995), our paper is the first to combine the provision of infrastructural goods and services as proxied by railway network mileage with theories of political survival. Also, this paper sheds more lights into the sweeping policies of nationalization of public services in the first half of the 20th Century in Western Europe. While media occasionally link the question of private or public provision with potential electoral outcomes (e.g., in the course of the general election in the UK in June 2017), we contribute by exploring whether the public or private provision of rail mileage affects a democratic leaders' tenure in office.

Our paper is structured as follows: Section 2 presents the theoretical framework of ownership of railway mileage provided. Section 3 provides an overview over our research design including a description of the new railway ownership data which are used for our empirical analysis in Section 4. Finally, Section 5 concludes.

2. Political survival, public goods, and the provision of rail transport

In this section, we explain how the type of provision of railways is linked to tenure in office in democracies. Our argument that public provision of rail transport is survival-enhancing is based on the assumption that political leaders' primary goal is to maximize tenure in office (Bell, 2011; Bueno de Mesquita et al., 2003; Downs, 1957). In exchange for political support, democratic leaders are more likely to provide public goods (Bueno de Mesquita et al., 2003; Deacon, 2009; Lake & Baum, 2001).

Whether citizens support the government in exchange for policies depends on the positive effect of policies and distribution of goods on individuals' net income and consumption. Increasing support is reached by providing a utility-maximizing mixture of both public and private goods to key supporters (e.g., Burstein, 2003). In Selectorate Theory, the so-called 'winning coalition' (Bueno de Mesquita et al. 2003), whose loyalty is needed for political survival, is larger in democracies. In this case, it is more effective to provide relatively more public goods such as infrastructure in exchange for political support (Deacon, 2009; Bueno de Mesquita et al. 2003; Lake & Baum, 2001).[3] This relationship between investment in public infrastructure and higher chances of re-election and promotion is supported by earlier studies (Cadot et al., 2006; Huet-Vaughn & Emiliano, 2019; Lei & Zhou, 2020). The provision of public goods, however, only generates a survival-enhancing effect for politicians if the increase in an individual's consumption from beneficial publicly provided goods is not outweighed by costs resulting from an increased tax burden needed to finance public goods provision (see Roessler, 2019).

Public goods can take many shapes, including national security, infrastructure, and communications that increase productivity and facilitate mobilization (e.g., Bueno de Mesquita & Smith, 2009; Bueno de M esquita et al., 2003; Roessler, 2019). Along these lines, rail networks share public goods qualities as they can contribute to national security and have spillover effects on economic development, potentially more than unproductive rental transfers would (see Plümper & Martin, 2003). An expanded railway network and reduced transport costs have been found to encourage regional development and benefit citizens (e.g., Herranz-Loncán & Fourie, 2017; Donaldson & Hornbeck, 2016; Redding & Turner, 2015; Pradhan & Bagchi, 2013; Caruana-Galizia & Martí-Henneberg, 2013).

We argue that the public provision of railway mileage generates a survival-enhancing effect for politicians by presenting political opportunities which are not available if railway infrastructure is privately provided. Primarily, the public provision of railway transport allows democratic leaders to increase individual consumption and fulfill their mobility needs by providing more or improved access to rail services at lower fares. Heavily subsidized railways such as the Belgian railways SNCB provide predominantly passenger services (Oum & Yu, 1994, p. 125f) at considerably lower costs for the individual consumer. This supported by studies reporting higher average fares, overcrowding problems, and a decline in punctuality after rail privatization (e.g., Parker, 2013; Jupe, 2010; Mees, 2005; Mizutani, 1999, p. 124).[4]

Also, railways, which largely depends on public subsidies, can operate less efficiently than private providers (Oum & Yu, 1994, p. 136) and cover unremunerative routes to the benefit of small, isolated communities that may not have rail access otherwise.[5] Public provision thus facilitates the clientelist allocation of resources, which is expected to increase voters' support of a political leader in the short-term (e.g. Boycko et al., 1996) but may be more economically inefficient (e.g. Amaral, 2008; Boardman & Aidan, 1989; Bogart, 2010; Caves & Christensen, 1980).

There are two additional political opportunities in the public provision of mass transport. First, and considering the macro-level, the public provision of railway can increase a citizen's welfare due to its positive effect in public sector employment. The government's budget allows political leaders to have more resources than private companies in order to create jobs in the railway sector, i.e. to employ much more workers, who as voters play important political roles depending on the electoral and party systems in question (McGillivray, 2004; Helland & Sørensen, 2009).[6] Second, an increase in wages is likely to be found before elections in public enterprises (Matschke, 2003, p. 108).

Private provision of railway transport, in contrast, is unlikely to offer comparable individual benefits. Due to the rent-maximizing incentives of private companies, production and operating costs tend to be lower and efficiency higher (e.g., Oum & Yu, 1994; Villalonga, 2000; Vining & Boardman, 1992). Thus, previous research suggests that private firms can produce and provide public services successfully under certain conditions (Andreoni & Bergstrom, 1996; Bagnoli & Lipman, 1992; Lindsay & Dougan, 2013; Montgomery & Richard, 1999; Roberts, 1992; Tabarrok, 1998). Yet, the track record of private rail infrastructure has

[3] This tendency to provide more public goods (e.g., Bausch, 2014; Bell, 2011; Deacon, 2009; Roessler, 2019) and performing better with the provision of public goods (e.g., Adam et al., 2011; Cao & Ward, 2015) has been discussed in previous work on public goods provision and political institutions.

[4] In an econometric simulation of the counterfactual public infrastructure, Preston and Robins (2013) find that fares are lower and services are better when privately provided. According to the authors, however, these welfare gains have been offset by increases in costs for infrastructure and operation.

[5] In the long-run, affordable prices may come at the expense of quality services, the creation of enormous debt, and eventually lead to unpopular policies on railway cuts with adverse electoral outcomes, as demonstrated by the Beeching Cuts in the British General Election of 1964 (Quiroz Flores & Paul, 2018).

[6] See, for instance, Boycko et al. (1996) who model political incentives of politicians for excess employment in public enterprises. This excess employment is reduced when restructuring towards private provision (Boycko et al., 1996; Martin & Parker, 1997).

been mixed at best, particularly in England. By the end of the 19th Century, there were more than 120 unregulated rail companies operating redundant and, for instance in the case of Hatfield in October 2000, even dangerous lines (Evans, 2013). Eventually, the British government forced these companies to consolidate in order to improve passenger safety and facilitate oversight.[7] In response to similar problems, the same policy of consolidation was implemented in France and Ireland as well.

In sum, we argue that voters will face poorer access to transport - in terms of service, coverage, prices, or maintenance - under private providers than under public ones. More importantly, as private provision is associated with lower overall benefits for political supporters, this is expected to increase their incentives to replace the incumbent with a challenger. In the following, we thus test our hypothesis that *the higher the share of private provision of rail transport, the higher the hazard rate of political leaders in democratic regimes*.

3. Data and empirical approach

3.1. Sample

In line with previous empirical work on leader survival (e.g., Bueno de Mesquita et al. 2003), our unit of analysis is the country-year-leader level. Our sample is defined by cases that meet two conditions. First, the country should be democratic. Second, there should be variation in the share of private provision of rail transport over time.

Regarding the first criterion, a democratic period takes place if a standardized version of the Polity IV *Polity* score - ranging from zero (perfect autocracy) to one (perfect democracy) - is not missing and is larger or equal than 0.75. In our estimation sample, the standardized *Polity* score ranges between 0.8 and 1, while the size of the winning coalition, as measured by Bueno de Mesquita et al. (2003), ranges from 0.75 to 1.

With respect to the second criterion, four countries in Europe present significant variation in the share of private provision of rail transport in our historical period of interest of 1913–1981: Austria, Belgium, France, and Germany. We did not include Ireland, Portugal, Spain, and the United Kingdom because rail transport was provided exclusively by private firms which were then fully nationalized. Likewise, we did not include the Netherlands because rail provision was mostly public. While these cases are undoubtedly interesting, they cannot offer insights in the context of our research question. Unfortunately, collecting data for other European countries during this historical period was beyond our resources. Having said this, our sample includes the democratic periods of Austria, Belgium, France, and Germany between 1913 and 1981. In a complementary model, we use Bogart's historical dataset of rail nationalizations (2009) in order to extend our period of coverage to the years 1871–1981.

We note that most of the observations in our estimation samples correspond to Belgium and France. As we will explain in the following subsection, this is caused by the large number of leader changes that take place in these two countries. In contrast, leadership is more stable in Austria and Germany during our period of interest and therefore these countries tend to contribute fewer observations to our estimation samples. In understanding why leaders stay in office longer than others, we indirectly explain why there are more leader changes in some countries than in others.

3.2. Dependent variable

Our dependent variable *Leader Fails* is equal to zero if a leader is in office and equal to one when they lose office. We use leader data from *Archigos*, a database of political leaders collected by Goemans et al. (2009). In our estimation sample there are 65 leaders: 52 were deposed and 13 are right-censored. We include a cubic polynomial of a leader's tenure in office as a measure of time dependence (Carter and Signorino 2010).

Our estimation sample includes two democratic leaders with exceptionally long tenure in office: Chancellor Julius Raab in Austria and Chancellor Konrad Adenauer in Germany. Raab was in office for 97 months or approximately eight years, while Adenauer was in office for 88 months or over seven years in office. This is similar to the tenure of the longest serving politician in Bueno de Mesquita et al.'s (2003) Hall of Fame of democratic leaders, the Japanese Prime Minister Sato with a tenure of 7.7 years.

However, Raab and Adenauer are exceptions in our sample. Indeed, the median tenure of leaders in our data is 12 months. While leaders in large coalition systems tend to stay in office for short periods of time relative to their counterparts in small coalition systems (Bueno de Mesquita et al. 2003), this can be considered as a comparatively short spell in office. For instance, the third longest serving leader in our sample of 65 leaders is French Minister Georges Clemencau with a tenure of 27 months or just over two years in office.

The short tenure of leaders in our sample is mostly driven by the unstable political systems in France and Belgium. For instance, Austria contributes four leaders to our estimation sample while Germany contributes eight leaders. In contrast, Belgium contributes with 23 leaders and France with 30 leaders. Indeed, there are multiple leaders during the same year in each country and this is quite pronounced in France and Belgium, which explains why a large number of observations in our sample corresponds to these two nations.

3.3. Independent variable

For the purpose of this analysis, we manually collected data on rail mileage owned by private firms which was set in relation to total rail mileage to construct the share (*Private Mileage Ratio*) in Austria, Belgium, France, and Germany between 1913 and 1981. The recent years of this data have been collected from the printed versions of the *Stateman's Yearbooks.* Our database complements Bogart's historical dataset of rail network nationalization (2009).

The variable can take values from zero to one with higher values representing a larger share of private railway services. *Private Mileage Ratio* ranges between zero and 0.783 in our sample. As the length of democratic periods has varied across countries, and due to multiple leader changes in particular years, the number of observations per country is not equally distributed within our sample. Also, private mileage ratio differs across countries; the mean private mileage ratio is 0.26 with a variance of 0.35. Austria's private mileage ratio, for instance, varied from 0.32 in 1920 to very low private provision in the 1970s, which increased slightly to a ratio of 0.09 in 1981. [8] France, in contrast, presents very high levels of private mileage ratio for the entire observation period.

The majority of our observations correspond to the so-called stabilization period of national railway networks, which took place between 1910 and 1960 (Martí-Henneberg & Jordi, 2013). We also cover part of the period of reduction of the networks (1960–2010). The period of stabilization is particularly important because most countries consolidated and reorganized the structure of their rail network, which led to a very interesting mix of public and private provision of rail transport.

For instance, some countries that had large participation of private

[7] See Nash and Smith (2020) or Preston (2008) for a more detailed historical overview of public transport procurement in Britain.

[8] During and shortly after WWII, railway mileage has been in public hands. Unfortunately, missing values in our primary sources for *Private Mileage Ratio* exist, especially during war periods. As a result, data is best illustrated with gaps (see Fig. 1). Regardless, data covers a large number of country-year-leaders, which is our unit of analysis.

firms ended up with a publicly operated network, most notably the UK. In other countries, private providers remained active well over the second half of the 20th century such as in Belgium and Austria (Aydin & Dzhaleva-Chonkova, 2013), although some of these private firms were gradually nationalized. In the Netherlands, rail transport was provided almost exclusively by private firms. Rail provision in France lies somewhere in the middle. With the exceptions of the government-operated Etat and Alsace-Lorraine lines, the country relied mostly on private concessions until the late 1930s, when a new legal and financial framework kept the network privately operated but controlled by Paris (Dougall, 1939). As illustrated in Fig. 1, this is reflected by a relatively high private mileage ratio compared to other European democracies of our sample.

This empirical analysis presented here necessarily requires variation in *private mileage ratio*. As mentioned before, our sample covers both the stabilization and reduction period of rail networks, which offer both cross- and within-country variation in the structure of the networks. This variation is the result of a tension between leaders' political incentives to remain in office and the 'sticky' nature of the initial mix of public-private provision of rail transport. Research in political survival (Bueno de Mesquita et al. 2003) indicates that leaders do find the incentives and political opportunities to overcome the persistent nature of institutions and shape them to strengthen their hold in office. We find that this is the case in the changing ownership of rail networks in the countries and periods we cover. While this opens the possibility of endogeneity in the *private mileage ratio*, we effectively use an instrumental variable approach –described in the next section– to tackle this particular challenge.

3.4. Control variables

We control of additional determinants of leaders' tenure in office suggested in the literature (e.g., Bueno de Mesquita et al. 2003; Goemans, 2008; McGillivray & Smith, 2008; Bueno de Mesquita & Smith, 2009; Escribà-Folch & Abel, 2013; Licht, 2010; Wright et al., 2015). In a first instance, we include percent change in government's expenditure per capita (Δ*(Expenditure pc)*) as an additional measure of public goods provision. For robustness, supplementary models used historical GDP per capita data from the Maddison Project (Bolt et al., 2018) as an alternative measure of public goods. As a third alternative proxy test, we have estimated supplementary models that replace changes in government's expenditure per capita with levels of expenditure per capita (c.f. Table A4 and Table A5 in the appendix).

In addition, and although there is a lack of variation in political and electoral institutions across the four countries in our sample and over time, we account for multiple sources of political and social conflict captured by the natural logarithm of Banks & Wilson's (2016) weighted conflict index, which includes several types of domestic dissent such as demonstrations and riots (*ln(Conflict)*).

In terms of further rail provision, we account for rail density as a measure of rail coverage.[9] This is given by the natural logarithm of all railroad mileage per square mile (*ln(Rail Sq Mile)*). We also include the natural logarithm of population density (*ln (Population Density)*) as this is both related to rail coverage and the difficulties in providing public goods to the rural population.

All these variables were obtained from the Cross-National Time-Series (CNTS) Data Archive (Banks & Wilson, 2016), which has a longer coverage of key determinants of tenure in office than the typical measures based on World Bank indicators used elsewhere (e.g., Bueno de Mesquita & Smith, 2010). The CNTS also offers a measure of GDP per capita, which is the indicator of public goods traditionally used by studies of political survival. However, it only covers the years after 1936. For this reason, we relied on government's expenditure per capita or on the measurement of GDP per capita from the Maddison project. They both covers the countries in our sample from 1861 to 1871 respectively. Summary statistics for all variables included in the baseline model are presented in Table 1.

3.5. Estimation approach

We estimate four discrete duration models with a probit link (Beck et al., 1998; Carter & Curtis, 2010) where the dependent variable is *Leader Fails*. Model 1 includes *Private Mileage Ratio*, Δ*(Expenditure pc)*, *ln (Rail Sq Mile)*, *ln(Conflict)*, and *ln(Population Density)* as covariates. Model 2 uses one-year lags of these variables as covariates. Model 3 uses the same specification of Model 2 but complements our sample with Bogart's historical dataset of rail nationalizations (2009), thus extending our period of coverage to the years 1871–1981. As the variable *ln (Conflict)* is not available for this entire period, it has been omitted in model 3. Standard errors in all our models are clustered at the leader level to account for a potential lack of independence across observations.

As private mileage provision might be endogenous to leader survival, we therefore use a probit link with instrumental variables (Newey, 1987). More specifically, Model 4 includes the same specification of Model 1 and uses the number of passenger cars as an instrument of *Private Mileage Ratio*. For our sample of Model 4, the mean of passenger

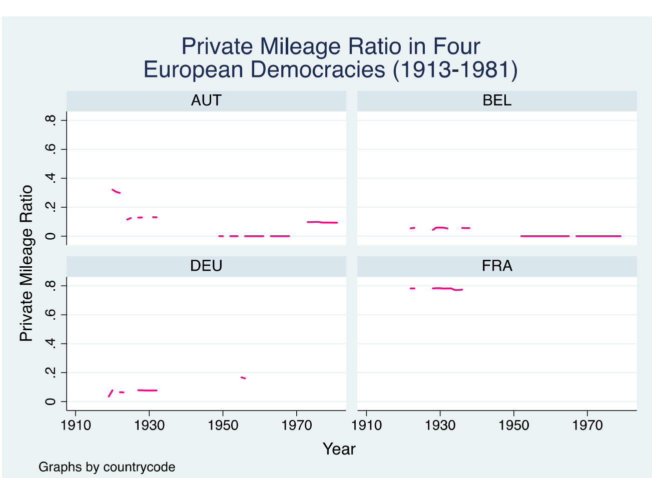

Fig. 1. Private mileage ratio in Austria, Belgium, Germany, and France, 1913–1981

Table 1
Descriptive statistics.

Variable	Obs	Mean	SD	Min	Max
Leader Failure	129	0.40	0.49	0	1
Months in office	129	25.43	28.53	1	141
Private Mileage Ratio	129	0.26	0.35	0	0.78
Austria	21	0.05	0.05	0	0.10
Belgium	58	0.02	0.03	0	0.06
France	40	0.77	0.02	0.71	0.78
Germany	8	0.07	0.01	0.06	0.08
Germany FR	2	0.16	0.00	0.16	0.17
Expenditure p.c.	129	8.59	28.51	−46.35	208.23
ln (Rail Mileage)	129	7.53	0.45	7.11	8.66
ln (Conflict)	129	5.65	2.84	0	9.87
ln (Population density)	129	8.26	0.63	7.53	9.01

[9] While citizens' preferences for provision of railway and spending is likely to depend on their location, available data does not allow to spatially identify railway mileage. See Xie and Levinson (2009) for a formal model considering spatial factors in transportation infrastructure.

cars is 1160.32 with a standard deviation of 877.14. Generally, a valid instrumental variable must be correlated with the endogenous variable and be uncorrelated with the disturbance (Greene, 2018). A valid instrument must also meet the exclusion restriction. We believe that our instrument meets these three conditions.[10]

First, historically, car ownership has been a strong competitor of rail travel in general and may have had an impact on demand for the public rail networks as service deteriorated and public debt increased. Second, the decision to purchase a car is mostly private and we assume that leaders do not have neither the political incentives nor the capacity to interfere with the private decision to purchase a car. We believe that this decreases any correlation between car passengers and the disturbance, thus reducing the probability of endogeneity. Lastly, we do not expect that the number of passenger cars will have a direct effect on the probability of leader deposition. While the development of the infrastructure for car travel may have an effect on leader survival, the utilization of this infrastructure and the purchase of cars by individuals is unlikely to determine a leader's prospects of staying in office.[11]

4. Empirical findings

Estimation results in Table 2 indicate that the private provision of rail transport increases the probability of leader deposition as the coefficients for *Private Mileage Ratio* and *Private Mileage Ratio*$_{t-1}$ across models are positive and significant. This is consistent with our hypothesis on the negative effect of the private provision of quasi-public goods.

Empirical findings of our control variables are consistent with previous work on political survival (e.g., Bueno de Mesquita et al. 2003; Escribà-Folch & Abel, 2013; Licht, 2010). For instance, the coefficients for the cubic polynomial indicate that there is no duration dependence, which is consistent with the argument that leaders face a constant hazard rate over time due to a weak loyalty norm in large coalition systems. Also, similar to Escribà-Folch and Abel (2013), we find that conflict increases the likelihood of leader removal reflecting adverse effects of political instability.

In order to illustrate the negative effect of the private provision of rail transport on leader survival, Fig. 2 presents the hazard rate of leaders as a function of the ratio of private mileage according to the estimation results of Model 2 in Table 2, with all other covariates held at their medians. Fig. 2 clearly shows that private mileage provision increases the probability of leader deposition. This substantive effect is present in all four models in Table 2.

According to Model 2, and holding all covariates at their median, a ten per cent increase in the share of rail mileage owned by private firms —our *Private Mileage Ratio*— increases the probability of leader deposition in roughly five to six percent points. More specifically and taking the 0.262 sample mean in private mileage ratio as a reference, Model 2 indicates that an increase in *Private Mileage Ratio* from 30 per cent to 40 per cent increases the probability of leader deposition from 36.8 per cent

Table 2
Estimation results (baseline models).

Variable	Model 1	Model 2	Model 3	Model 4
Private Mileage Ratio	1.052**			3.030**
	(0.50)			(1.29)
Private Mileage Ratio$_{t-1}$		1.385**	0.805*	
		(0.58)	(0.44)	
Δ(Expenditure pc)	0.002			0.002
	(0.00)			(0.01)
Δ(Expenditure pc)$_{t-1}$		−0.005	−0.003	
		(0.01)	(0.01)	
ln (Rail Sq Mile)	0.156			0.247
	(0.32)			(0.33)
ln (Rail Sq Mile)$_{t-1}$		0.312	0.230	
		(0.40)	(0.28)	
ln (Conflict)	0.274***			0.209**
	(0.07)			(0.08)
ln (Conflict) $_{t-1}$		0.125**		
		(0.06)		
ln (Population Density)	−0.161			0.602
	(0.33)			(0.66)
ln (Population Density) $_{t-1}$		0.047	−0.209	
		(0.44)	(0.33)	
Months in Office	0.052	−0.016	−0.011	0.048
	(0.03)	(0.03)	(0.01)	(0.03)
Months in Office^2	−0.001	0.001	0.000	−0.000
	(0.00)	(0.00)	(0.00)	(0.00)
Months in Office^3	0.000	−0.000	−0.000	0.000
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	−2.688	−4.165	−0.557	−9.901*
	(2.08)	(3.06)	(2.48)	(5.26)
Ath ρ				−0.477
				(0.31)
ln σ				−1.77***
				(0.10)
Observations	129	116	249	125
Clusters	65	56	109	63
Log-Likelihood	−68.42	−65.53	−153.6	−20.84

Notes: Discrete duration models with a probit link where the dependent variable is *Leader Failure*. Unit of analysis is country-leader-year. Model 4 uses an instrumental variable probit link model. Wald test for a null of no endogeneity in Model 4: (Ath $\rho = 0$) with $\chi^2(1) = 2.34$ and p-value of 0.1258. Significance levels: ***p < 0.01, **p < 0.05, *p < 0.1.

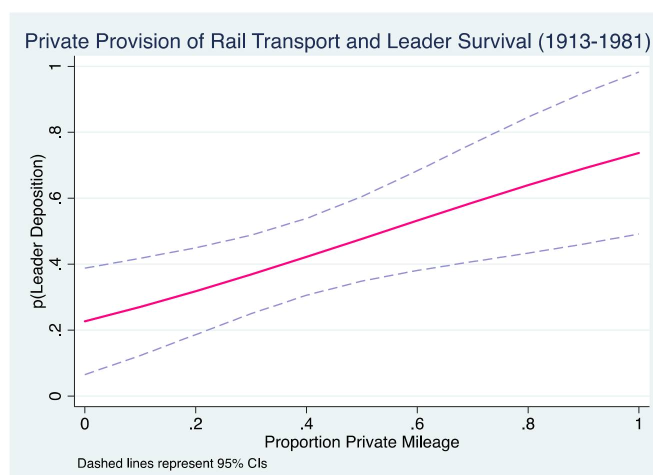

Fig. 2. Probability of leader deposition (model 2, Table 2).

[10] Testing the validity of an instrument is an imperfect task. In Table A1 and A2 in the Appendix we present full results of our two-step instrumental variable probit models from Tables 2 and 3. Results include the first stage regression which shows that the effect of passenger cars on *Private Mileage Ratio* is positive and highly statistically significant. Our results also suggest that we fail to reject the null hypothesis of no endogeneity. However, it is more difficult to show that an instrument meets the exclusion restriction. Recent work has shown that valid instruments are very unlikely to pass empirical tests of the exclusion restriction (Wan, 2018; Deng, 2019), and only under very restrictive conditions can a test be implemented (Baiocchi et al., 2014). These conditions are not present in our sample. In spite of this, we believe that the use of passenger cars will not have a direct effect on leader survival. Additionally, we recognize that there may be omitted variables that are correlated with passenger cars in the first stage regression. Indeed, a common issue for all quantitative analyses –including our own– is that the 'true' set of independent variables is unknown or cannot be validly quantified (c.f. Neumayer & Plümper, 2017, p. 130ff). While we cannot be sure that we have not omitted variables, which necessarily limits our analysis, we are confident that the instrumental variable approach used here addresses our main concern of endogeneity.

[11] We thank an anonymous reviewer for pointing out the difference between the construction and utilization phase of transport infrastructure.

to 42.2 per cent, with standard errors of 0.06 and 0.05 respectively.

The models of Table 2 use changes in government expenditure per capita as a measure of public goods provision. As mentioned before, we used this variable due to its extensive historical coverage of the countries in our sample. While this is an adequate measure of wealth, we supplemented our analyses by replacing government expenditure per capita with a measure of GDP per capita in 2011 US Dollars with multiple benchmarks as provided by the Maddison Project (Bolt et al., 2018). This database provides the longest historical coverage of GDP per capita and it has allowed us to extend the number of observations significantly. Summary statistics for all covariates for the estimation sample of Model 1 are available in Table A3 in the Appendix. Table 3 presents estimation results; the estimation strategy is identical to the strategy of Table 2.

These estimation results from Table 3 confirm that increases in the private mileage ratio increase the likelihood of leader deposition. Indeed, the coefficients for *Private Mileage Ratio* and *Private Mileage* $Ratio_{t-1}$ in Models 1 and 2 are positive and significant. As an illustration, Model 2 indicates that an increase in *Private Mileage Ratio* from 30 per cent to 40 per cent increases the probability of leader deposition from 44.1 per cent to 49 per cent, with standard errors of 0.04 and 0.05 respectively. This type of increase of the probability of deposition is also observed in Model 4, our instrumental variable model that relies on the number of passenger cars as an instrument of *Private Mileage Ratio*.[12]

It is important to note, however, that the coefficients for *Private Mileage Ratio* in Table 3 are not as large as in Table 2 - extending the historical coverage has moderated the magnitude of the effect of the private provision of rail transport. This is also evident in Model 3, which extends our original data with Bogart's historical dataset of rail nationalizations (2009). In this case, *Private Mileage Ratio* is no longer significant.

To sum up, our results generally indicate that a large proportion of private rail mileage increases the likelihood of leader deposition. While the sample only comprises a small number of countries for a significant period of time, our results are robust to different specifications, to the use of an instrumental variable as well as to different sources of public goods provision.

Since our estimation sample is restricted to four countries, however, we were unable to estimate panel data models that could explore the effect of unobserved heterogeneity through fixed or random effects. In spite of this, we estimated a random effects probit model for our four countries and estimation results showed that the panel level variance component was not significant. Moreover, it has been argued that probit models cannot be estimated with conditional fixed effects, while unconditional fixed effects lead to bias estimates (StataCorp, 2017). Thus, we did not estimate fixed effects models. Future work could collect more data on countries with significant variation in *Private Mileage Ratio*, which would facilitate the estimation of panel data models.

5. Discussion: survival-enhancing private provision

In this research article, we examined whether democratic political leaders have a higher likelihood of remaining in office when a larger share of railway mileage is provided publicly. Our argument of increasing electoral incentives with public provision of railways is empirically supported by the analysis. Yet, it appears puzzling at first that the same countries that provided mass transport publicly, opted for policies of privatization or at least sweeping private provision of railway services since the 1980s.

The 1980s are a natural inflexion point in the analysis of public and private provision of services, particularly in the areas of transport and communication. At this time, there were sweeping ideological changes across the world – as well as large economic shocks– that turned privatization into a viable political strategy. Explaining and summarizing motives for privatization have received large attention in research (e.g., Montagnes & Bektemirov, 2018; Clarke & Pistelis, 2005; Bortolotti et al., 2004; Megginson and Netter 2003; Vickers & Wright, 1989). Amongst others, the drive for privatization stemmed from efficiency considerations and political rent-seeking behaviour. Fiscal imbalances and political uncertainty trigger privatization as windfall revenues can be used to serve political purposes in the present (Montagnes & Bektemirov, 2018; Bortolotti et al., 2004). As a politician's confidence about re-election decreases, it becomes more and more convenient to invest less in public assets but privatize (Montagnes & Bektemirov, 2018). In other words, it is rational for political leaders to prefer revenues from privatization over public provision of railway services if it generates higher private rents or electoral incentives than public provision.

While an empirical analysis of the effect of ownership structure on political survival may benefit from data from the 1980s, we believe that the forces that made privatization viable in the 1980s make this period and subsequent years qualitatively different from the historical stabilization and reduction periods covered in this study. In addition, these changes reduced a large proportion of the variation in rail ownership that we identified in the period covered by our paper. Against this backdrop, our data collection is limited to 1913 to 1981. Nevertheless, we believe this is a very useful dataset that will provide a foundation for the analysis of subsequent changes in the ownership structure of mass transport.

6. Conclusion

In this article, we use historical data on the ownership of rail miles in four European democracies between 1913 and 1981 to disaggregate the provision of public goods and estimate its effect on leaders' tenure in office. Specifically, we argue that the private provision of public goods should increase the hazard rates of leaders in large coalition systems because it reduces the general welfare of supporters, thus fueling their incentives to replace the incumbent with a challenger. Empirical results support our theoretical expectation: discrete duration models of leader survival suggest that the private provision of rail transport increases the probability of leader deposition.

The evidence that the public provision of railway mileage is beneficial for a political leader helps explain the sweeping policies of nationalization of public services in the first half of the 20th Century in Western Europe. When private provision is unregulated, chaotic, and inefficient, politicians in democratic countries can seize this opportunity to take over routes and offer public goods in the form of nationwide rail travel at affordable prices in exchange of political support. The evidence in this paper indicates that the private provision of rail transport was not politically beneficial between 1913 and 1981, which partly explains large waves of nationalization.

This does not mean that the public provision of rail transport is under all circumstances financially superior to private provision. As mentioned in the theoretical section, there is mixed evidence in terms of the success of the public or private provision of mass transport. Our argument therefore does not focus on efficiency or long-term viability, but on the political opportunities that public provision offers in the short term. As elaborated in our discussion, opting for privatization or private-public partnerships may be rational under certain circumstances. In order to test whether leader survival under privatization differs from survival under private-public partnership, further research and data collection will necessary, and we hope that future research will undertake such endeavor.

[12] In Table A2 in the Appendix we present the full results of Model 4 from Table 3, a two-step instrumental variable probit model. Results include the first stage regression which shows that the effect of passenger cars on *Private Mileage Ratio* is positive and highly statistically significant. Our results also suggest that we fail to reject the null hypothesis of no endogeneity.

Table 3
Estimation results (including GDP per capita).

	Model 1	Model 2	Model 3	Model 4
Private Mileage Ratio	1.270***			2.129**
	(0.452)			(0.836)
Private Mileage Ratio$_{t-1}$		1.204***	0.453	
		(0.439)	(0.306)	
ln (GDP per capita)	−0.160			0.171
	(0.370)			(0.438)
ln (GDP per capita) $_{t-1}$		−0.591	−0.164	
		(0.381)	(0.207)	
ln (Rail Sq Mile)	−0.0164			0.364
	(0.434)			(0.452)
ln (Rail Sq Mile)$_{t-1}$		−0.00203	0.277	
		(0.546)	(0.285)	
ln (Conflict)	0.221***			0.258***
	(0.0612)			(0.0843)
ln (Conflict) $_{t-1}$		0.0729		
		(0.0462)		
ln (Population Density)	0.0829			0.0604
	(0.462)			(0.616)
ln (Population Density) $_{t-1}$		0.274	−0.375	
		(0.567)	(0.302)	
Months in Office	0.0540*	0.0106	0.00240	0.0528*
	(0.0277)	(0.0255)	(0.0135)	(0.0275)
Months in Office^2	−0.000626	0.000214	−0.000105	−0.000526
	(0.000660)	(0.000653)	(0.000278)	(0.000661)
Months in Office^3	0.00000136	−0.00000286	0.000000424	0.000000691
	(0.00000388)	(0.00000423)	(0.00000160)	(0.00000382)
Constant	−1.708	1.754	1.939	−7.812*
	(3.494)	(3.396)	(2.104)	(4.510)
Ath ρ				−0.273
				(0.208)
ln σ				−1.753***
				(0.0639)
Observations	159	146	277	144
Clusters	83	75	127	75
Log-Likelihood	−87.79	−86.88	−174.5	−29.63

Notes: Discrete duration models with a probit link where the dependent variable is *Leader Failure*. Unit of analysis is country-leader-year. Model 4 uses an instrumental variable probit link model. Wald test for a null of no endogeneity in Model 4: (Ath $\rho = 0$) with $\chi^2(1) = 1.72$ and p-value of 0.1895. Significance levels: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

CRediT authorship contribution statement

Alejandro Quiroz Flores: Conceptualization, Investigation, Data curation, Data collection, Formal analysis, Visualization, Validation, Writing – original draft, Writing – review & editing. **Katharina Pfaff:** Conceptualization, Investigation, Data curation, Data collection, Validation, Writing – original draft, Writing – review & editing.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.retrec.2021.101046.

Appendix

Table A1
First and second stage results for model 4 of Table 2.

Variable	Leader Failure (2nd Stage)	Private Mileage Ratio (1st stage)
Private Mileage Ratio	3.030**	
	(1.29)	
Passenger Cars		0.0001***
		(0.00)
Δ(Expenditure pc)	0.002	−0.003*
	(0.01)	(0.00)
ln (Rail Sq Mile)	0.247	0.178***
	(0.33)	(0.06)
ln (Conflict)	0.209**	0.024**
	(0.08)	(0.01)

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Table A1 (*continued*)

Variable	Leader Failure (2nd Stage)	Private Mileage Ratio (1st stage)
ln (Population Density)	0.602	−0.533***
	(0.66)	(0.06)
Months in Office	0.048	0.003
	(0.03)	(0.00)
Months in Office^2	−0.000	−0.000*
	(0.00)	(0.00)
Months in Office^3	0.000	0.000
	(0.00)	(0.00)
Constant	−9.901*	−3.100***
	(5.26)	(0.49)
Ath ρ	−0.477	
	(0.31)	
ln σ	−1.77***	
	(0.10)	
Observations	125	
Clusters	63	
Log-Likelihood	−20.84	

Notes: First and second stage of instrumental variable probit link model. Dependent variable is *Leader Failure*. Unit of analysis is country-leader-year. Wald test for a null of no endogeneity: (Ath $\rho = 0$) with $\chi^2(1) = 2.34$ and p-value of 0.1258. Significance levels: ***p < 0.01, **p < 0.05, *p < 0.1 Standard errors in parentheses.

Table A2
First and second stage results for model 4 of Table 3.

Variable	Leader Failure (2nd Stage)	Private Mileage Ratio (1st stage)
Private Mileage Ratio	2.129**	
	(0.836)	
Passenger Cars		0.000260***
		(0.0000422)
Δ(Expenditure pc)	0.171	−0.339***
	(0.438)	(0.114)
ln (Rail Sq Mile)	0.364	0.133
	(0.452)	(0.0926)
ln (Conflict)	0.258***	−0.00105
	(0.0843)	(0.00739)
ln (Population Density)	0.0604	−0.411***
	(0.616)	(0.110)
Months in Office	0.0528*	0.00253
	(0.0275)	(0.00399)
Months in Office^2	−0.000526	−0.0000797
	(0.000661)	(0.0000761)
Months in Office^3	0.000000691	0.000000312
	(0.00000382)	(0.000000360)
Constant	−7.812*	5.387***
	(4.510)	(0.735)
Ath ρ	−0.273	
	(0.208)	
ln σ	−1.753***	
	(0.0639)	
Observations	144	
Clusters	75	
Log-Likelihood	−29.63	

Notes: First and second stage of instrumental variable probit link model. Dependent variable is *Leader Failure*. Unit of analysis is country-leader-year. Wald test for a null of no endogeneity: (Ath $\rho = 0$) with $\chi^2(1) = 1.72$ and p-value of 0.1895. Significance levels: ***p < 0.01, **p < 0.05, *p < 0.1 Standard errors in parentheses.

Table A.3
Descriptive statistics (based on Model 1 in Table 3)

Variable	Obs	Mean	SD	Min	Max
Leader Failure	159	0.40	0.49	0	1
Months in office	159	23.08	26.37	1	141
Private Mileage Ratio	159	0.24	0.32	0	0.78
Austria	36	0.11	0.10	0	0.32
Belgium	59	0.02	0.03	0	0.06
France	40	0.77	0.02	0.71	0.78
Germany	22	0.07	0.01	0.03	0.08
Germany FR	2	0.16	0.00	0.16	0.17
ln (GDP per capita)	159	8.84	0.57	7.87	9.95

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Table A.3 (*continued*)

Variable	Obs	Mean	SD	Min	Max
ln (Rail Mileage)	159	7.51	0.43	7.11	8.66
ln (Conflict)	159	5.84	2.87	0	9.87
ln (Population density)	159	8.20	0.59	7.53	9.01

Table A.4
Alternative proxy robustness test for Model 1 of Table 2

Variable	Model 1
Private Mileage Ratio	0.913*
	(0.470)
ln (Expenditure pc)	0.0837
	(0.127)
ln (Rail Sq Mile)	0.243
	(0.302)
ln (Conflict)	0.297***
	(0.0820)
ln (Population Density)	−0.346
	(0.390)
Months in Office	0.0466
	(0.0319)
Months in Office^2	−0.000457
	(0.000746)
Months in Office^3	1.19e^{-07}
	(4.44e^{-06})
Constant	−2.728
	(2.093)
Observations	133
Clusters	68
Log-Likelihood	−70.52

Notes: Discrete duration models with a probit link where the dependent variable is *Leader Failure*. Unit of analysis is country-leader-year. Model 1 uses the logarithm of government expenditure per capita. Significance levels: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table A.5
Alternative proxy robustness test for Model 4 of Table 2

Variable	Leader Failure (2nd Stage)	Private Mileage Ratio (1st stage)
Private Mileage Ratio	2.140**	
	(1.022)	
Passenger Cars		0.000200***
		(3.86e^{-05})
ln (Expenditure pc)	0.110	−0.0970***
	(0.135)	(0.0350)
ln (Rail Sq Mile)	0.341	0.252***
	(0.303)	(0.0667)
ln (Conflict)	0.267***	0.00809
	(0.0872)	(0.00846)
ln (Population Density)	0.0424	−0.504***
	(0.588)	(0.0801)
Months in Office	0.0495	0.00648*
	(0.0303)	(0.00372)
Months in Office^2	−0.000459	−0.000181***
	(0.000688)	(7.00e^{-05})
Months in Office^3	3.06e^{-07}	8.84e^{-07}***
	(3.84e^{-06})	(3.07e^{-07})
Constant	−7.167*	3.276***
	(4.327)	(0.405)
Ath ρ	−0.295	
	(0.241)	
ln σ	−1.811***	
	(0.0937)	
Observations	128	
Clusters	65	
Log-Likelihood	−17.88	

Notes: First and second stage of instrumental variable probit link model. Dependent variable is *Leader Failure*. Unit of analysis is country-leader-year. Wald test for a null of no endogeneity: (Ath $\rho = 0$) with $\chi^2(1) = 1.50$ and p-value of 0.22. Significance levels: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$ Standard errors in parentheses.

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