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Conference Paper

The firm location race – Regulating incentive packages given to firms by local and regional governments

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2016: Demographischer Wandel -
Session: Fiscal Competition, No. G10-V2

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Hanke, Philip; Philip, Hanke; Klaus, Heine (2016) : The firm location race – Regulating incentive packages given to firms by local and regional governments, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2016: Demographischer Wandel - Session: Fiscal Competition, No. G10-V2, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel und Hamburg

This Version is available at:

<https://hdl.handle.net/10419/145862>

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The firm location race – Regulating incentive packages given to firms by local and regional governments

March 1, 2016

Abstract

This paper analyzes the competition between jurisdictions for the relocation of firms and its implications for the various national and international subsidy control regimes (state aid control). We model the attraction of firms to jurisdictions through subsidies as a race with continuous investment over time, where local governments exert inefficiently high efforts, which increase with the number of competitors and their respective spending. This setting makes the case for better investment and subsidy controls by higher-level governments while emphasizing structural problems of implementation at the same time.

Keywords: subsidies, state aid control, inter-jurisdictional competition, hazard rate model

JEL classification: H71, K21, L50

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1 The prevalence of location races

In the early 2000s, Seattle-based aircraft manufacturer Boeing sought a new location for its firm headquarters. In a rare instance of transparency in those kinds of decisions, the company hired Deloitte to organize a call for bids – cities and counties could bid to become the new headquarters site. Crucial components of these bids were so-called incentive packages in order to increase the attractiveness of the locations. Among others, Dallas/Fort Worth, Denver and Chicago submitted viable bids, and eventually the latter prevailed. The combined offer of Chicago and the state of Illinois consisted in subsidies to the amount of around \$63 million. The incentive package consisted in grants for job training, technology and capital improvements, as well as tax abatements (including a property tax abatement even though Boeing was leasing its premises). The city would buy-out the current tenants of the designated new site and pledged to build a public heliport conveniently close to the new headquarters building (Lyne, 2001). A similar competition was staged shortly after for the location of the manufacturing site for the new Boeing 787 Dreamliner plane – a competition in which Washington state succeeded in maintaining Boeing within its jurisdiction by offering a subsidy package worth \$3.2 billion. Such large deals are not uncommon. As Mattera and Tarczynska (2013) report, U.S. state and local governments have awarded more than \$64 billion through large subsidy packages over the last three and half decades. By their count, eleven deals cost \$1 billion or more, and 240 incentive packages were worth more than \$75 million. Over the last decade, the number of such large deals has doubled, and so has their annual cost, now averaging roughly \$5 billion per year (although there is a decline in the 2010s). One in ten do not create any new jobs, but merely involve the relocation of an existing facility to another location, often within the same state and sometimes even within the same metropolitan area. Through these deals, Boeing received \$4.4 billion in subsidies over the last years (ibid.).

In other instances, jurisdictions went even further in order to be attractive for the investment by not only offering subsidies, but changes in regulations tailor-made for the firm to be attracted. For example, the trend to build Las Vegas-style casino macro-complexes (as they already exist in Macao and Singapore) recently almost arrived in

Europe. In 2012, Las Vegas Sands Corporation, which, *inter alia*, operates the famous Venetian Resort Hotel Casino as well as the Sands Expo and Convention Center in Las Vegas, proposed the construction of a so-called EuroVegas. According to news reports, it was supposed to host twelve hotels, six casinos, a convention center, three golf courses, an indoor stadium, theaters, shopping malls, bars, and restaurants. Although it is not known with how many governments the investors negotiated, the competition soon narrowed down to one between Madrid and Barcelona. The complex was expected to create 260,000 mostly unskilled jobs. In times of high unemployment, this was a tempting offer to the Spanish government. But the company required more. They demanded substantial tax exemptions (virtually turning the village into a tax haven for ten years) and infrastructure investment by the government to support the project. Furthermore, they considered the Spanish anti-smoking laws an obstacle to the atmosphere in the casinos and thus pushed for a waiver. It was also reported that “the group wanted changes to Spain’s labour laws, lower social security payments, relaxed smoking laws and the creation of university degrees in casino management” (Reuters, 28.3.2012). Eventually, the conservative Spanish government – faced by opposition from an alliance of labor unions, the Roman Catholic Archdiocese of Madrid, and socialist politicians – had to pull the brake. The main trigger seems to have been that the investors demanded that the government offer a guarantee not to change the favorable legislation in the future without paying compensation. Deputy Prime Minister Soraya Sáenz de Santamaría declared: “It is impossible to create a legal shield against regulatory changes because the courts are sovereign, majorities can change and the idea of indemnifying against future regulatory changes does not exist in our legal system” (Financial Times, 13.12.2013). Although the project eventually failed, it shows how far governments are willing to go in order to attract firms and investments. It also illustrates that the competition takes place through various locational factors, such as subsidies, tax breaks, but also labor or public law. Subsidy decisions, even if beneficial to the economy overall, may produce under certain conditions distinct groups of winners and losers. Thereby the process of competing for firm locations can become a very costly one, as all participants in the competition spend more than what would be optimal in total. Most importantly, time matters. Jurisdictions spend money not only in order to attract firms, but also to do so *before* any other jurisdiction attracts

the firm. Hence, they make investments that have poignant distributional and welfare effects.

Most of the standard literature on subsidies to attract firms reaches the conclusion that bidding wars are always detrimental because of the distortions of competition in the product markets they ensue. This is not the spin taken by the model presented here. Here, state aids are *a priori* positively valued, even though they of course produce costs. The idea is that they might help to attain a better match between firms and locations, or that they favor the creation of new firms with better products. For instance, Mueller (2000) interprets subsidies to firms as a provision of public goods from which society in principle profits. Thus, this paper focuses on efforts made by jurisdictions to further develop the attractiveness of a location.

Jurisdictions do not know beforehand when firm-relocation opportunities might arise, but they can invest in order to have them appear earlier. However, this produces a time-cost tradeoff, in which an earlier attraction comes to a higher price and a higher associated risk of making a wrong offer, or not being successful with the attraction at all. As a result, the more jurisdictions invest and the more rapidly the investments are made, the higher the potential damage (in terms of wasted resources) for the people living in these jurisdictions. This setting is actually very similar to “patent races,” in which firms invest in research and development, but only the firm that reached an innovation first reaps its benefits.

This paper draws its inspiration from the literature on the timing of innovations under rivalry and applies it to government spending to attract firms. In a series of seminal papers, Kamien and Schwartz (1972, 1976) study a firm’s choice of development period and introduction time for a single innovation. Their main assumptions are that the firm’s costs increase with compression of the development period, that firms have fewer profit opportunities if they prolong their development period, and that the probability with which its rivals innovate and introduce new products (described as a hazard rate) affects the potential rewards available to the firm. This model has been generalized and refined in Kamien and Schwartz (1980). In order to reflect the continuous effort required to attract firms, our approach follows the extension of the patent race models in Lee and Wilde (1980), which interprets R&D investment not as a lump-sum payment but

as a continuous flow of investment that ceases only once any participant in the race is successful with their effort. In this case, the number of participants in the competition has a different effect on the individual spending decisions.

This paper proceeds as follows: section 2 compares the legal regimes in place, section 3 unfolds the model of location races and discusses the equilibrium solution, section 4 deduces the policy implications from the model, and section 5 concludes with an outlook.

2 Institutional background around the world

The different regimes currently in place to restrict state subsidies to firms almost constitute a continuum of policies, which might be due to the complexity and political delicacy of the matter.

United States. The United States does not have a dedicated regulatory regime for public subsidies to firms. There are some provisions, such as that federal funds may not be used to engage in pirating, that is, one state subsidizing a firm so that it relocates from one state to another. Also some states prohibit their local governments from this behavior. In various cases, such as *City of Columbia v Omni Outdoor Advertising, Inc.*, 499 U.S. 365 (1991), courts ruled that local governments are exempt from antitrust regulation. In *Columbia v Omni* it also ruled that political activity of a firm in order to achieve favorable regulation harming the competitor(s) is not subject to liability due to the Sherman Act.

Additionally, case law based on the interpretation of Article I, Section 8, Clause 3 of the U.S. Constitution (the Commerce Clause) bans discrimination against out-of-state firms, but applies rather to tax matters and not to direct subsidies. The Supreme Court “never squarely confronted the constitutionality of subsidies,”¹ mainly because individual taxpayers do not have the standing to challenge governmental expenditures² (see e.g. Sykes, 2010).

As a consequence of this lack of coherent regulation of subsidies, gathering data on subsidies handed out by U.S. jurisdictions proves to be rather cumbersome. As there is no federal monitoring body, research has to rely on third-part aggregations delivered mostly

¹Camps Newfound/Owatonna, Inc. v. Town of Harrison, 520 U.S. 564, 589 (1997)

²DaimlerChrysler Corp. v. Cuno, 547 U.S. 332 (2006)

by anti-“corporate welfare” NGOs. More than a decade ago, Thomas (2000) estimated – for the first time in the U.S. – the total cost of subsidies of around \$50 billion per year. More recent estimates seem to indicate that some states indeed spend several hundreds of millions of dollars on individual subsidy programs. These numbers only take into account direct subsidies, but not the economic costs of adjusting regulation in order to be more attractive a location in the competition for investments. Thus, no reliable U.S. data exist about the total of subsidies spent at the different jurisdictional levels.

European Union. The European Union’s approach is fundamentally different compared to the U.S. It is mainly led by considerations of market integration and political cohesion. The main concern is – just like in European competition law – the prevention of distortion of competition. The European state aid control regime is based on Articles 107 to 109 of the Treaty on the Functioning of the European Union (TFEU) and the various guidelines issued by the European Commission.

Taking articles 107 and 108 as starting points, the Commission and the European Court developed a legal definition of what constitutes state aid based on certain criteria. First, there needs to be some kind of transfer of government funds (be they direct or indirect). A transfer of government funds takes also place if the government is willing to forego certain revenues, such as in the cases of tax cuts or exemptions from certain fees. Secondly, this transfer of funds must confer an economic advantage upon a firm which it would not have gained otherwise. This means that a government can legitimately transfer money to firms for instance through a tender, as long as the state is not paying an excessive price for the contract. Thirdly, transfers have to benefit specific firms in order to constitute state aid. For instance, if a government invests in infrastructure in a certain region in order to improve the region’s competitiveness, thus benefiting all businesses equally, then this is not considered state aid. Finally, the transfer must have an effect on competition and trade between two or more member states. If those four criteria are met, then there is state aid.

In 2010, European Union member states granted a total of around €63 billion of non-crisis aid (excluding railways), equivalent to 0.49% of EU GDP. The overwhelming share of non-crisis aid is given to industry and services, with smaller amounts given to fisheries, agriculture (on top of agriculture subsidies paid for directly by the EU budget),

and the transport sector.

Before granting state aid and implementing the measures taken, EU member states have to notify the European Commission (EC) and await the outcome of the Commission's investigation. If the states fail to do so, the state aid is considered unlawful. In the 2000-2010 period, the EC took 980 decisions on unlawful aid. The decisions were negative in 22% of the cases, leading to the requirement to recover the unlawful state aid, and in 3% of unlawful aid cases, conditions were attached to the decision. Among duly notified state aids, the Commission's intervention rate is only one tenth of the intervention rate in unlawful aids (European Commission, 2011). It should also be noted though that in some more problematic cases there are informal negotiations taking place beforehand between member states and the Commission.

Mixed regimes. Some other, albeit informal, arrangements can be found – within countries and internationally through regional and/or international organizations. The OECD's Arrangement on Officially Supported Export Credits is – even called that way on official documents – a “Gentlemen's Agreement” reducing subsidies related to said credits. The current participants in this arrangement are Australia, Canada, the EU, Japan, Korea, New Zealand, Norway, Switzerland and the United States. Canada's system is very similar to the United States'. It is included as an example here though because in some aspects it lies in between the U.S. and the EU. While aids to firms are generally unregulated at the federal level, they are regulated at the provincial level of government. The ten provinces were able to come up with and sustain a “Code of Conduct on Incentives” (CoC) regarding pirating (or poaching, as it is commonly referred to in Canada). This code is part of the 1994 Agreement on Internal Trade (AIT) and bans provincial subsidies to induce the relocation of existing facilities from one province to another (Thomas, 2011).

At the international level, the most important agreement is the Agreement on Subsidies and Countervailing Measures (SCM), which is an integral part of the World Trade Organization. The WTO is an interesting case in that it combines fully sovereign nations (even more so than the EU) and merges the above-mentioned systems.

A subsidy exists if there is a financial contribution by a government or any public body within the territory of a WTO member state (i.e., loan, loan guarantee, grant,

equity infusion, tax credit, provision of goods other than infrastructure, purchase of goods, indirect transfers through a funding mechanism), or there is any form of income or price support in the sense of Article XVI of GATT 1994, and if a benefit is thereby conferred. As in European State Aid Law, the subsidy has to be specific in order to be deemed problematic. In principle, the criterion of specificity is wider at the WTO level than in EU State Aid Law. It not only applies to subsidies for specific individual companies, but also to industry-specific and even regionally specific subsidies.

Most importantly though, the GATT, on which the WTO is based, exclusively applies to the trade of goods. Rules regarding the international trade of services are found in the General Agreement on Trade in Services (GATS). Article XV GATS establishes a very weak anti-subsidy mechanism, which only advocates negotiations between WTO member states. Para 2. reads:

“2. Any Member which considers that it is adversely affected by a subsidy of another Member may request consultations with that Member on such matters. Such requests shall be accorded sympathetic consideration.”

Remedies against subsidies are only available if a WTO member state (that is, not a private party such as a competing firm) starts a procedure against the aid-granting state. The case is then heard by the Dispute Settlement Body (DSB), which can seek assistance by the Permanent Group of Experts (PGE). If the PGE comes to the conclusion that the subsidy in question is indeed prohibited, then it will recommend to the subsidizing state that it withdraw its support without delay. If, after a possible appeal, the subsidizing state continues its practice, then the complaining state can enact appropriate measures. Finally, if it is determined that a certain state aid subsidizes imports, causes injury to a domestic industry and that there is a link between the subsidized imports and the injury, then a member state may impose countervailing measures.

An aspect that this is quite particular to the WTO rules is that countervailing measures can also be taken if the effects of subsidized imports from more than one member state cumulate (Art. 15, SCM). In European State Aid Law the adverse effects are calculated for a specific measure. Yet, an EU member state could be suffering from the combined effects of various state aid measures in different other member states.

3 The model

There are n jurisdictions competing for the relocation or creation of a firm which currently does not reside in any of the competing jurisdictions, that is, there is a potential gain to the system of jurisdictions tied together in an open economy. It is assumed that the “market for firms” consists only of one firm, that is, that the investment is specific to the attraction of one firm. In order to attract another firm, the process has to start from scratch. This reflects the observation that not all firms have the same needs in terms of locational factors. For instance, a state program to train its employees might be helpful to attract one kind of firms, while establishing a large business park might induce other kinds of firms to resettle. The citizens’ valuation of having the firm relocate to their jurisdiction is $V > 0$, otherwise a jurisdiction would not offer a subsidy at all.

In order to attract firms, jurisdictions have to make investments to increase their attractiveness. Therefore, the politicians of every single jurisdiction i ($i = 1, \dots, n$) set the amount of investment, modeled as a hazard rate called h_i at which it succeeds with its bid. The earlier the investments are made, the higher the chance that a firm moves to that jurisdiction. However, to bring forward the investments comes implies higher investment costs. For example, an infrastructure project becomes more expensive, if it is realized at short notice. This means there is a time-cost trade off (see e.g. Scherer and Ross, 1990), where inducing an early firm location decision incurs more costs for a jurisdiction. This hazard rate represents the conditional probability density that a jurisdiction wins a firm location. The process contains a probabilistic component, reflecting the complexity of the matter as well as the limited flow of information. The term $\frac{1}{h_i}$ represents the expected time until the jurisdiction is successful in its endeavor.

The costs of this investment are described by a strictly convex cost function $c(h_i) > 0$, thus, $c'(h_i) > 0$ and $c''(h_i) > 0$.

In order to actually have a time-cost trade-off, it must be assumed that the average expected cost of winning a firm relocation, $\frac{c(h_i)}{h_i}$, increases in the hazard rate.

The government of the jurisdiction aims to win the prize V , reflecting how it values the relocation of a firm. As long as no firm has settled in any of the participating jurisdictions, all of the latter incur the cost of investing in their attractiveness.

3.1 Levels chosen by local governments

The local governments now make decisions on investments and subsidies.

As long as no jurisdiction has been successful in acquiring a firm by time t , jurisdiction i incurs a cost $c(h_i)$. The density function for jurisdiction i acquiring a firm at time t is $h_i e^{-h_i t}$. If the jurisdiction was too slow, meaning that the firm already moved somewhere else, then its income is zero and no more costs occur after the relocation of the firm.

With this setup, the ex-ante expected present value of jurisdiction i 's objective function (EPV_i) is:

$$EPV_i = \int_0^\infty e^{-rt} \left[e^{-\sum_{j=1}^n h_j t} (-c(h_i)) + e^{-\sum_{j \neq i} h_j t} h_i e^{-h_i t} V \right] dt \quad (1)$$

The last equation can be simplified and rewritten:

$$EPV_i = \frac{h_i V - c(h_i)}{r + \sum_{j=1}^n h_j} \quad (2)$$

Given this expected present value of the objective function, each government now maximizes this ex-ante function by choosing its hazard rate h_i , yielding the following first-order condition:

$$\frac{\partial EPV_i}{\partial h_i} = \left[(V - c'(h_i)) \left(r + \sum_{j=1}^n h_j \right) - h_i V + c(h_i) \right] = 0 \quad (3)$$

This first-order condition for the setting with inter-jurisdictional competition (FOC_c) can be transformed into:

$$FOC_c := V \left(r + \sum_{j \neq i} h_j \right) - c(h_i) \left[\frac{c'(h_i)}{c(h_i)} \left(r + \sum_{j=1}^n h_j \right) - 1 \right] = 0 \quad (4)$$

The first term in this first-order condition is the gain from being the first to acquire the firm. It equals the increase in spending due to the higher costs of winning the competition.

Deriving by h_i , that is, calculating the second-order condition, shows that there is indeed a maximum of ex-ante expected profits:

$$\frac{\partial FOC_c}{\partial h_i} = -c''(h_i) \left(r + \sum_{j=1}^n h_j \right) < 0 \quad (5)$$

From looking at the reaction curve $h_i(h_k)$ with $k \neq i$, it is possible to conclude that the hazard rates are strategic complements, that is, the effort exerted by jurisdictions increases with the effort of the other jurisdictions:

$$\frac{\partial h_i}{\partial h_k} = -\frac{\frac{\partial FOC_c}{\partial h_k}}{\frac{\partial FOC_c}{\partial h_i}} = \frac{V - c'(h_i)}{-\frac{\partial FOC_c}{\partial h_i}} \quad (6)$$

After solving 4 for $c'(h_i)$, inserting the expression into 6 and assuming the expected present value in 2 to be positive, the following expression holds:

$$\frac{\partial h_i}{\partial h_k} = \frac{h_i V - c(h_i)}{-\left(r + \sum_{j=1}^n h_j \right) \frac{\partial FOC_c}{\partial h_i}} > 0 \quad (7)$$

Using these conditions, the equilibrium condition FOC_c^* with decentralized decision making can be determined. Assuming that all jurisdictions are symmetric, the equilibrium condition can be determined:

$$FOC_c^* := V(r + (n-1)h) - c(h) \left[\frac{c'(h)}{c(h)}(r + nh) - 1 \right] = 0 \quad (8)$$

Since $\frac{\partial FOC_c^*}{\partial h} < 0$, this equilibrium is stable.

From equation 8 it can be deduced that the equilibrium hazard rate h increases with the number of jurisdictions n taking part in the firm relocation race:

$$\frac{\partial h}{\partial n} = -\frac{\frac{\partial FOC_c^*}{\partial n}}{\frac{\partial FOC_c^*}{\partial h}} = \frac{Vh - c'(h)h}{-\frac{\partial FOC_c^*}{\partial h}} > 0 \quad (9)$$

Thus, if the competition is fierce, politicians will spend more money on winning it. That means that in order to bring the investments forward, more money has to be spent. This coincides with experience from subsidy races, when jurisdictions put a lot of extra efforts and costs to attract a firm before another jurisdiction had the chance to do so.

3.2 The optimal hazard rate from a social welfare point of view

In a next step, it is possible to compare the equilibrium outcome of competing jurisdictions with the level of investment and effort of a hypothetical social planner. That is the outcome of a supra-jurisdictional authority, maximizing a utilitarian welfare across all local jurisdictions. This computation will yield the socially optimal outcome for the entire system of competing jurisdictions. Because this optimization exercise is conducted at a level above the objective functions of the local governments, all externalities are internalized and adequately taken into account. The time-cost trade-off inherent to location races becomes optimized, thereby identifying the optimal hazard rate.

The expected social welfare is then given by:

$$ESW = \int_0^{\infty} e^{-rt} \left[e^{-\sum_{j=1}^n h_j t} \left(\sum_{k=1}^n [h_k V - c(h_k)] \right) \right] dt = \frac{\sum_{k=1}^n [h_k V - c(h_k)]}{r + \sum_{j=1}^n h_j} \quad (10)$$

Again, assuming the symmetries between jurisdictions, the expected social welfare in the equilibrium can be written as:

$$ESW = \frac{nhV - nc(h)}{r + nh} \quad (11)$$

The first-order condition is:

$$\frac{\partial ESW}{\partial h} = \frac{1}{(r + nh^*)^2} \left[nVr - nc(h^*) \left[\frac{c'(h^*)}{c(h^*)} (r + nh^*) - n \right] \right] = 0 \quad (12)$$

Analogously, an equilibrium condition can be defined:

$$FOC_{ESW}^* := Vr - c(h^*) \left[\frac{c'(h^*)}{c(h^*)} (r + nh^*) - n \right] = 0 \quad (13)$$

The difference to the outcome in equation 8 is that the social planner values the profits from firm relocation (V) to a lesser extent, because he or she knows that firm relocation to one jurisdiction implies that no other jurisdiction is able to reap the rents thereof.

Unlike the politicians at the local level, this perspective considers saving the total cost of $nc(h)$ after the firm location, whereas a single jurisdiction only takes into account its own cost savings. Because the race creates externalities upon other jurisdictions and these are considered by the hypothetical social planner, the optimal hazard rate h^* decreases with the number n of jurisdictions competing in the race:

$$\frac{\partial h}{\partial n} = -\frac{\frac{\partial FOC_{ESW}^*}{\partial n}}{\frac{\partial FOC_{ESW}^*}{\partial h}} = \frac{-c(h)\left(\frac{c'(h)}{c(h)}h - 1\right)}{-\frac{\partial FOC_c^*}{\partial h}} < 0 \quad (14)$$

The policy-relevant question is how the socially optimal hazard rate can be achieved in practice and which regulatory framework is required to prevent the over-spending of competing jurisdictions, while at the same time leaving local jurisdictions an incentive to provide optimal conditions for location of firms on the other.

It might seem tempting to simply abolish inter-jurisdictional competition through incentive packages all together. But the hazard rate is not defined exclusively by the specific monetary subsidy. It encompasses all kinds of state activities, including e.g. laws on labor relations, smoking, or even prostitution (as in the case of Eurovegas). In this framework, completely restricting the local governments ability to set its hazard rate would be tantamount to complete centralization, without any components of multi-layered governance. This would be contrary to every insight from economic theories of federalism, which advocate for decentralization. In this view, federal systems give voters not only a voice option, but also an exit possibility. Federations can effectively preserve markets and provide incentives for economic growth and development. In a federation, local and regional jurisdictions serve in a way as laboratories to experiment with different mixes of laws, taxes, and services. Insofar, abolishing interjurisdictional competition at the local level at all is neither feasible nor would it be welfare enhancing. Thus, the task to be achieved here is to find a vertical set-up of mechanisms, rules and laws preventing inefficient over-spending while maintaining the benefits of decentralized government.

3.3 With subsidy control

From our foregoing analysis we learned that a supra-jurisdictional entity could in principle regulate the competition towards a social optimum. Such an authority, can do so

by approving the incentive packages of local jurisdictions, similarly to what is common practice in the EU. State subsidies to firms in the EU have to be notified to the European Commission, which can then opt to investigate the spending decision. If there is a contradiction to EU law, that is, if it is deemed incompatible with the internal market, the European Commission can prohibit the transaction.

To extend the model presented above which operates in a probabilistic setting, we assume that the regulating authority operates under the same probabilistic conditions as the local jurisdictions. This reflects the idea that all jurisdictions take their decisions under uncertainty. The probability p_i that jurisdiction i 's efforts find approval is a function of the hazard rate, reflecting a general skepticism of the regulatory authority with regard to incentive packages. For instance, EU law knows the so-called *de minimis* rule, granting automatic approval of very small subsidies (without even requiring notification). Thus, we assume that $p(h_i)$ is a function of h , with $p'(h_i) < 0$ and $p''(h_i) > 0$. In other words, the longer the time $\frac{1}{h_i}$ until there is success in the firm location race, the more lenient is the regulator, who will consider slow attraction of firms as generally more thought-through government spending, which is in accordance with the local preferences of citizens. But because of the better information on the side of the local jurisdiction, the regulator might approve even for too high hazard rates or deny for too low rates. The expected payoff of the jurisdiction can therefore be re-written as:

$$EPV_i^{SC} = \int_0^\infty e^{(-r + \sum_{j=1}^n p(h_j)h_j)t} [p(h_i)h_iV - c(h_i)] dt = \frac{p(h_i)h_iV - c(h_i)}{r + \sum_{j=1}^n h_j} \quad (15)$$

The payoffs after approval of the measure remain the same.

Again, the condition determining the chosen hazard rate in the market equilibrium with subsidy control (SC) follows:

$$FOC_{SC}^E := p(h)[1 + \epsilon_{ph}(h)]V(r + (n-1)h) - c(h) \left[\frac{c'(h)}{c(h)}(r + nh) - p(h)[1 + \epsilon_{ph}(h)] \right] = 0 \quad (16)$$

where $\epsilon_{ph}(h) = \frac{p'(h)h}{p(h)}$ is the elasticity of the approval probability with respect to the

chosen hazard rate. The easier it is for the regulating authority to determine whether the state aid is appropriate, the higher the absolute value of the elasticity. Given this probability of approval $p(h)$, the new expected social welfare is:

$$ESW = \frac{np(h)hV - nc(h)}{r + nh} \quad (17)$$

This welfare function can again be maximized and yields the optimal hazard rate described by:

$$FOC_{ESW}^{SC} := p(h)[1 + \epsilon_{ph}(h)]Vr - c(h^*) \left[\frac{c'(h^*)}{c(h^*)}(r + nh^*) - np(h)[1 + \epsilon_{ph}(h)] \right] = 0 \quad (18)$$

By introducing the approval mechanism, the regulator now has the capability to intervene in the local jurisdictions' investment decisions and to curb the investments to the efficient level. What is important here is that besides the number of local jurisdictions the competence of the regulatory authority becomes crucial. Either that there is highly qualified staff that can assess the proposed incentive package or that the information conveyed to the regulation authority becomes standardized in a way that it can undertake easily judicial review and economic assessment. Insofar the bureaucratic procedures associated with cases of state aid control reflect to a certain degree the need of the regulation authority to become more knowledgeable against the local jurisdictions. One may presume from our analysis that the need to standardize the information flow between local jurisdictions and the regulation authority, in order to make the latter more knowledgeable, becomes higher the larger the number of local jurisdictions is (implying a higher hazard rate). However, one may also conclude that a small number of local jurisdictions may not imply more standardization of information, but more competent staff employed by the regulation authority, which assess competently single incentive packages (implying a lower hazard rate).

4 Towards a better subsidy control regime

For the background of our discussion several issues arise with regard to the optimality of subsidy control regimes. A first is concerned with legal certainty.

We modeled the decision of the regulator as a probabilistic function. This reflects the fact that the setting in the model is one of imperfect information, and that regulators are prone to errors due to the difficulties of assessing the merits of state spending. Thereby the elasticity $\epsilon_{ph}(h)$ plays an important role as it measures how the hazard rate affects the probability of approval and thus the quality of the regulatory system.

A fundamental problem of state aid regulation is the inherent complexity of the matter. Even though the actors involved are not necessarily irrational, their cognitive powers to monitor an overwhelming amount of information are limited (see e.g. Haucap (2011) for an overview of the literature and application to competition policy). State aid involves a large number of actors who might be affected by this kind of problem: firms, politicians, citizens, the European Commission, the European Court of Justice, and other courts potentially dealing with state aid decisions.

The task is therefore to design a manageable regulatory regime that avoids regulatory errors due to complexity. A similar argument has been made in the field of anti-trust policy and is discussed there under the term error cost-approach. The idea is that rules and their enforcement should be designed in such a way that it minimizes the sum of the welfare costs due to decision errors of type I (false positives) and type II (false negatives) plus information and other transaction costs (see e.g. Haucap (2011); Christiansen and Kerber (2006)).

Thus, it seems highly problematic that at the moment the case-by-case assessment of subsidies causes legal uncertainty. Risk-averse parties might end up not entering a contract for fear of having the aid agreement annulled by the regulator, thereby reducing the chance that the most beneficial investment decision will be taken. Moreover, firms might face sudden liquidity problems and politicians might want to avoid the embarrassment and political repercussions a negative decision might entail. Thus, state aid control should aim generally at more legal certainty, making location races at least more predictable and safe costs, which are otherwise incurred.

A second issue that impacts on optimality is administrative effort. With many small subsidies, the administrative overhead attached to each investment decision can quickly become non-negligible. In this case, the total cost in (14) is not only $nc(h)$, but also a mark-up to that cost. It is then easy to see that the welfare gain from pre-authorizing incentive packages is reduced. These administrative costs are borne in practice by the regulator (e.g. the European Commission), but also by the member states and private firms, which have to comply with the regulation.

Therefore the European Commission, for instance, attempts several approaches to curb down the administrative burden. One is to make better use of de minimis rules. Generally, all aid below the threshold of €200,000 granted over a period of three years is not regarded as state aid in the sense of Article 107(1) TFEU with a reduced ceiling of €100,000 applying to aid in the field of road transport (Council Regulation (EC) No 994/98). However, this rule only applies to so-called transparent aid, that is, aid where the amount can be calculated exactly in advance without the need to carry out a risk assessment. The Commission is currently in the process of revising these rules and is issuing new guidelines on a rolling basis. Furthermore, the Commission issued an intricate set of guidelines pertaining to various kinds of aids. It declared certain aids as compatible with the common market (Commission Regulation (EC) No 800/2008 of 6 August 2008), thus giving block exemptions for certain kinds of aid. As a result, to find a better balance between administrative efforts, the value of regulatory oversight and the benefits and costs involved in location races, is certainly an exercise worth to be pursued.

A third issue that has effect on the optimality of granting subsidies in our setting is the introduction of fines on successful subsidy bids which later turn out as unlawful. In principle those fines have a deterrent effect and establish a cost component that slows down the location race. Thereby imposing a fine ex-post can serve as a deterrent to sunk investments also among the non-winning jurisdictions. Legally and politically, it is problematic to implement fines; even the quite stern European state aid control mechanism does not know punitive damages against member states. However, in competition policy it is not uncommon to order fines against companies which were engaged in a cartel or abused their market power. The EU can even impose fines on governments. The Commission can withhold money if it decides that financial management of European spending

is inadequate³. Yet, in the realm of the European state aid control system, there are no provisions for fines. This, of course, has to do with the peculiar nature of state aid control as a restraining device of sovereign countries. There does not seem to be a political will to confer a sanctioning power to the European Union. But fines against member states are also not unrealistic: For example, a recent change to the Danish competition act provides that henceforth all unlawful national state aid and probably also unlawful and incompatible aid according to the TFEU shall be repaid to the state treasury instead of the aid-granting authority (which might be a local or regional jurisdiction). Such a procedure seems politically viable and might have a strong deterring effect on wasteful state aid spending (Lund, 2013).

But before a functioning fine system can be considered another weakness of the actual practice of state aid control would have to be cured. Currently, there is no system in place for the ex post evaluation of state aid in Europe. Instead, all assessments with relevance to the European state aid regime, whether they are carried out in the member states or at the Commission during the notification procedure, take place ex ante. Evaluations, if at all, are conducted ad hoc. The aid schemes are approved ex ante based on pre-defined criteria, without evaluating properly their impact on markets and over time (European Commission, 2013). Moreover, national authorities find it often difficult or even impossible to measure the effects of state aid and oppose making the process more bureaucratic (Nicolaidis, 2013). Similarly, in the United States, there is no systematic evaluation of economic development programs and all such tasks are left to NGOs, which need to operate through Freedom of Information Act requests and research of media reports. Thus, while fining grantors of (unlawful) subsidies might be an interesting instrument to make the location race more efficient, it would require first that ex post evaluations about the performance of subsidies are conducted.

5 Conclusion

The idea of this contribution was to model subsidy races between jurisdictions in analogy to patent races. Even though subsidies and patents are fully distinct matters, there is

³For instance, the United Kingdom had to pay up to £1 billion in fines in 2011, see www.telegraph.co.uk/news/worldnews/europe/eu/8269828/Britain-faces-1bn-of-EU-fines.html.

an apparent similarity between them. In both fields actual and potential competition may induce competitors to spend more resources for winning the race than a reasonable social planner would. With respect to location races through subsidies we studied several relevant factors in a hazard rate model that allows us to draw some straightforward policy conclusion that contribute to the debate on reforms of subsidy control.

While other studies on interjurisdictional competition through subsidies come also to the conclusion that a ban or tight regulation of subsidies is necessary, this model makes a step forward insofar that it not only calls for control of the actual incentive package or state aid (that is, the specific measures), but generally of investments made in order to attract firms (that is, non-specific measures, such as e.g. the concept of “horizontal aid” in EU state aid law).

Our model is primarily a model of inter-jurisdictional competition with many participants, unlike the more industrial-organization- and/or strategic-trade-oriented models by Collie (2000, 2002, 2005) and Besley and Seabright (2000, 1999). Hence for future research it would certainly be tempting to get these different streams of literature more aligned. However, incorporating all aspects of industrial organization with all possible market structures into our model set-up would unfortunately lead to excessive complexity.

While accommodating all possible market structures seems too tedious, a more tractable way forward would be to say a little bit more about the firms that the jurisdictions compete for. After all, the welfare effects will be different if the firm in question is a new, highly innovative firm, an old firm in an obsolete industry, or, for example, a large retailer chain.

Another possible extension is to take better into account the interest group politics at play in the local jurisdiction. The literature on public spending emphasizes that electoral rules play a role in how politicians spend tax money. It is relatively straightforward how such a public choice aspect would enter into the model. Instead of facing a prize V and costs $c(h_i)$, the politician deciding on the investment level incorporates into his or her decision only a fraction of the costs or deviates parts of the prize into his or her own pocket, analogously to the corporate governance problem in firms with separation of ownership and control. This research avenue stresses once more how close public economics and business economics can come not only analytically but also when a significant economic

policy problem has to be solved.

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