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Attracting Academic Talent: Brain Competition Policy in Vienna and Munich

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Abstract:

Human capital is the main source of regional economic growth in knowledge economies. Hence, international mobility of human capital in general and of academic talent (students and university researchers) in particular has received increasing attention from economic research and policy makers. This paper presents a framework for urban policies denoted as brain competition policy which aims to attract international academic talent. Policy actions and developments in Vienna (Austria) and Munich (Germany) are identified, described and systematically compared. Empirical data which allow us to evaluate these policies to a certain extent are presented. Vienna has an already quite comprehensive brain competition policy and has successfully attracted international students and professors, whereas Munich has less so developed in this direction. However, in both cities urban policies to attract academic talent can be further developed in a way that recognises the importance of a comprehensive and strategic approach.

Keywords: academic talent, mobility, urban policy, cities, human capital

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Content

1	Introduction	1
2	Literature overview and conceptual framework	3
2.1	Academic talent, mobility and urban growth	3
2.2	Brain Competition Policies at the urban level	4
3	Brain Competition Policies in comparison	9
4	Empirical evidence on locational attractiveness for academic talent	18
5	Conclusion	23
6	References	25

1 Introduction

Issues of economic growth are high on the agenda of national and regional policy makers. One powerful engine for economic growth is human capital. For example, multiculturalism and an open atmosphere that welcomes international talent has increased London's prosperity, which is "built on its ability to attract the rich, the clever and the hard working from all over the world" (The Economist, 30.6.2012, 11).

Several factors such as skill biased technological change and ageing have provoked a locational competition for human capital. National and regional policy makers respond to this competition with measures to improve the attractiveness of their regions and institutions as magnets for national and international talent (Wildavsky, 2010; Reiner, 2010). The paper explores the economic rationale for urban policy makers to attract internationally mobile academic talent, presents a policy framework denoted as brain competition policy (BCP) and critically investigates implemented policies in a comparative perspective (Lim, 2010; Huggin,s 2010). The focus lies on the mobility of international academic talent as one important fraction of human capital. We define academic talent as a group consisting of university students, postdocs and professors. Compared to the intranational mobility of students, which is generally much larger than inflows from foreign countries, international academic talent is a specific factor for economic success in a globally connected and multicultural world of innovation and business because of positive externalities emanating from knowledge spillovers and diversity (Tripl and Maier, 2011).

The city of Vienna (Austria) and the city of Munich (Germany) serve as empirical cases to investigate urban BCP and its potential effects. Vienna and Munich serve as appropriate and interesting cases for comparison because (1) labour market studies and anecdotal evidence suggests, that they are close substitutes as locations for mobile academic talent; both are (2) embedded in a complex federal system of a coordinated market economy, (3) located in central Europe, (4) German speaking, (5) economically strong and (6) have a similar research environment dominated by a large classical university and a technical university surrounded by public research institutes based on similar academic traditions.

The guiding research questions are: Firstly, which policy options and policy designs to attract international academic talent are available from a conceptual point of view? Secondly, what brain competition policies are in place in Vienna and Munich to attract international academic talent and what factors may explain regionally differentiated policy designs? Thirdly, how do the city of Vienna and the city of Munich perform in terms of attracting international academic talent?

Our contribution to the literature lies in the conceptualisation and empirical investigation of an emerging policy field with increasing importance for regional and urban policy makers. Additionally, we undertake case studies for two central European cities which complements the US dominated literature with additional evidence. Finally, by adding a comparative dimension the paper contributes to the on-going process of (regional) policy learning and delivers relevant insights into the design and evolution of regional innovation policies, of which BCP is an important element.

The paper is structured as follows: Section 2 reviews the literature on the effects of human capital accumulation on urban growth, outlines the factors attracting mobile human capital and presents a policy framework for urban policies pursuing to lure academic talent from abroad. Section 3 presents and compares the BCP of Vienna and Munich as well as their relatedness and complementarity to

policy actions at the national and European level. Empirical evidence on the internationalisation and diversity of academic talent in both cities is provided in Section 4. The final chapter concludes and suggests ideas for further research and policy development.

2 Literature overview and conceptual framework

2.1 Academic talent, mobility and urban growth

Theoretical and empirical work in economics shows that human capital is one of the main forces driving knowledge diffusion innovation, economic growth and structural change towards knowledge-intensive business sectors. Lucas (1988) models positive externalities from human capital accumulation and interaction as the growth engine in an endogenous economic growth model. Following Glaeser (2011), “the strength that comes from human collaboration is the central truth behind civilization’s success and the primary reason why cities exist.” While Lucas growth model assumes a closed economy, Nijkamp and Poot (1998) account for the openness of regional economies. As a result, migration policy influences growth performance due to different strategies of migrant selection: A migration policy in favour of highly skilled migrants propels economic growth whereas the opposite holds if there is a negative selection of migrants in place. Important mechanisms through which mobile human capital contributes to regional growth are knowledge spillovers, emanating from the interaction between foreign and native human capital if their knowledge is different but complementary (Döring and Schnellenbach, 2006, Fujita 2007).

Empirical research has produced ample evidence in favour of human capital driven endogenous growth models and the existence of human capital externalities (Glaeser, 2000; Moretti, 2004). Florida (2002) finds a high correlation between talent and high-technology industry location which together deliver high income levels of urban economies. For Europe, Sterlaccini (2008) and Stehrer (2010) report econometric evidence on positive effects of highly educated migrants on regional performance measured by growth of GDP per capita and patenting per capita. The importance of tertiary educated human capital for developed economies is highlighted by Aghion and Howitt (2006). They reject the common assumption in growth theory that primary, secondary and tertiary human capital are perfect substitutes. Probably, global competition and technological change necessitates an increase in the input of tertiary human capital into advanced production processes in which high-wage countries possess a competitive advantage. Human capital may also vary with respect to cultural diversity, an issue that has gained importance under increasingly globalised migration flows. Yet, there exists a trade-off between productive benefits emanating from heterogeneous interpretations of problems and different appraisals of new ideas on the one hand, and increased transaction costs due to communication between individuals with, for example, different mother tongues or cultural habits regarding trust on the other hand (Alesina and Ferrara, 2005). However, empirical studies confirm overwhelmingly positive net effects of cultural diversity on economic performance in general and innovation performance in particular. Ottaviano and Peri (2006) provide econometric evidence for the US metropolitan areas between 1970 and 1990. The productivity of US-born citizens living in areas which experienced an increase in cultural diversity increased because of a more multicultural environment. Audretsch et al. (2010) and Niebuhr (2009) find positive effects of cultural diversity (measured *inter alia* by nationality) on knowledge intensive entrepreneurship and patent applications respectively.

Mobile academic talent, i.e. students, postdocs and professors, are a small but very important fraction of human capital. Beside the already stated arguments they may trigger economic growth through several specific channels. The effect of international students on economic performance depends on the stage of their study. Before graduation, they contribute to aggregate regional demand due to

spending on tuition fees, housing, food etc. Additionally and perhaps even more important, international students foster the development of a creative milieu and a multicultural and open climate in the hosting city. After graduation, they may enter the urban labour market and increase the diversity and supply of highly skilled workers (Faggian and McCann, 2009). From a public policy point of view, attracting international students which enter the local labour market after graduation is often considered as an optimal policy because private and social costs emanating from integration and recognition of certificates are minimised (Zimmermann, 2008). Empirical work supports the strategy of attracting students because studying abroad significantly increases the probability of living abroad (Oosterbeek and Webbink, 2009). A cost-benefit analysis of international students in the UK concludes: “It is clear that it is well worth maximising the number of both EU and non-EU international students.” (Vickers and Bekhradnia, 2007). This result, however, may be driven by high tuition fees at UK universities to some extent.

University researchers, i.e. postdocs and professors, have a positive impact on economic growth due to different forms of knowledge spillovers, e.g. in the form of contract or collaborative research with regional firms or via academic entrepreneurship (Schiller and Revilla Diez, 2010; Baba et al., 2009). A number of studies point to the importance of university researchers located in spatial proximity to the clusters of emerging high-tech industries. One frequently cited example in this respect is the birth of the US biotechnology industry. The start-ups are located in close proximity to star scientists in the respective scientific field because they are dependent on knowledge spillovers from these agents (Zucker et al., 1998). High-tech entrepreneurship is often a highly localised phenomenon since (star) scientists who become firm (co-)founders face natural time constraints: “Finding time and resources to do all that they are doing is an ongoing struggle and they rarely become involved in starting companies or transforming existing ones very far from where they are doing the rest of their work.” (Zucker and Darby, 2007). Positive knowledge spillovers may also occur if university researchers engage in intersectoral mobility and start to work as corporate researchers in the regional business sector. Last but not least, spatial concentration of cutting edge research in urban universities may attract knowledge seeking firms from other regions (Alcácer and Chung, 2007).

One important fact for urban policy makers is the spatially bounded nature of knowledge spillovers from universities because the transfer of tacit knowledge necessitates or is facilitated due to face-to-face contacts (Jaffe, 1989; Feldman, 2000; van Geenhuizen and Nijkamp, 2007). Another type of localised positive spillovers arises from the cumulative migration behaviour of scientists. One of the main pull factors for university researchers is the spatial and institutional proximity to the best peers (OECD, 2008). As a result, attracting researchers with a high scientific reputation to a specific university triggers a further inflow of highly motivated young researchers into the city region (Lucas, 1988). In addition international researchers offer access to international collaborative networks.

2.2 Brain Competition Policies at the urban level

Policy makers at different spatial scales aim to accelerate economic growth in order to improve social welfare. Traditionally, urban and regional policies have tried to achieve this goal with several forms of subsidies for physical capital investments such as infrastructure projects or inward investments of extra-regional firms (Markusen, 2008). Yet, this traditional concentration of regional public policies on improving conditions for physical capital investment seems increasingly questionable and empirical research points to several advantages of a more human capital centred approach (Blair, 1995, Florida 2007, Glaeser 2011). Hence, the well-established argument in the literature is that

regional and urban policies should be redirected towards human capital policies which favour, for example, the upgrading of the “people climate” instead of the “business climate” (Mathur, 1999; Batey, 2002; Florida, 2002; Carneiro and Heckman, 2003; Markusen, 2008; Reiner, 2010). This shift in regional policy is of course a gradual one because physical and human capital are complements and not substitutes; too one-sided strategies are likely to produce costly policy failures (Grilliches, 1969).

Broadly speaking, two types of human capital policies can be distinguished: Internal human capital accumulation and external human capital attraction. Both policies increase the stock of human capital and economic growth, whereas a brain drain may reduce the growth potential of a regional economy. In the past, national and regional governments have relied primarily upon internal human capital accumulation but recently a paradigm change in policy making that places emphasis also on external human capital attraction is observable (Straubhaar, 2001). It should be stressed that the objective function of national and regional governments may not correspond to a simple maximisation of the net inflow of international students or international scientists. For instance, urban policy makers may aim for an intensification of selection affects such that the human capital inflows represent a draw from an even more talented and skilled part of the global human capital distribution.

The main reasons for human capital attraction policies to gain importance are the increasing scarcity and mobility of highly skilled individuals. The scarcity results from the soaring demand for highly skilled workers in the emerging knowledge economy and an ageing process which already reduces the supply of human capital in some states and regions (Faggian and McCann, 2009; Acemoglu and Autor, 2012). Together these developments result in a locational competition between jurisdictions for mobile factors in general and human capital in particular (Tiebout, 1965; Malecki, 2007; Reiner, 2010; Wildavsky, 2010). This competition is increasingly between cities because of two reasons: Firstly, urban areas harbour universities and urban labour markets are characterised by a relative higher demand for highly skilled individuals. Secondly, national barriers for mobility are already abolished (for the EU27 countries) or substantially reduced (for the highly skilled from non-EU27 countries) which increases *ceteris paribus* the importance of other, often highly localised factors (Florida, 2007).

Internal human capital accumulation policies and external human capital attraction policies can be rationalised on the basis of market failures in the market for education and the labour market (Laranja et al., 2008). Friedman (1962) argues that the benefits of education accrue not only to the educated individual but to the broader society because education contributes to social welfare “by promoting a stable and democratic society” (Friedman, 1962 86). A similar argument applies for human capital attraction strategies. Knowledge diffusion, stemming from human capital mobility represents a positive externality and results in a socially suboptimal level of spatial knowledge diffusion and mobility (Bretschger, 1999).

Reiner (2010) provides a policy framework for human capital policies referred to as brain competition policies (BCP). BCP encompasses policies for the attraction, retention, education, circulation and utilisation of human capital in general and academic talent in particular. BCP can be understood as part of a wider set of regional innovation policies and regional competitiveness policies, which, according to Potter (2009 992) comprises “policies that have as a principal objective the aim of influencing regional competitiveness seen in terms of the capacity to attract and retain mobile factors and associated economic activity.” BCP provides a general policy framework whereas observed policies show different designs and sometimes no explicit strategy in the sense of BCP exists. It is built upon theories that explain mobility and location decisions of human capital just like monetary policy is based upon monetary growth theory. There are of course numerous and different factors at

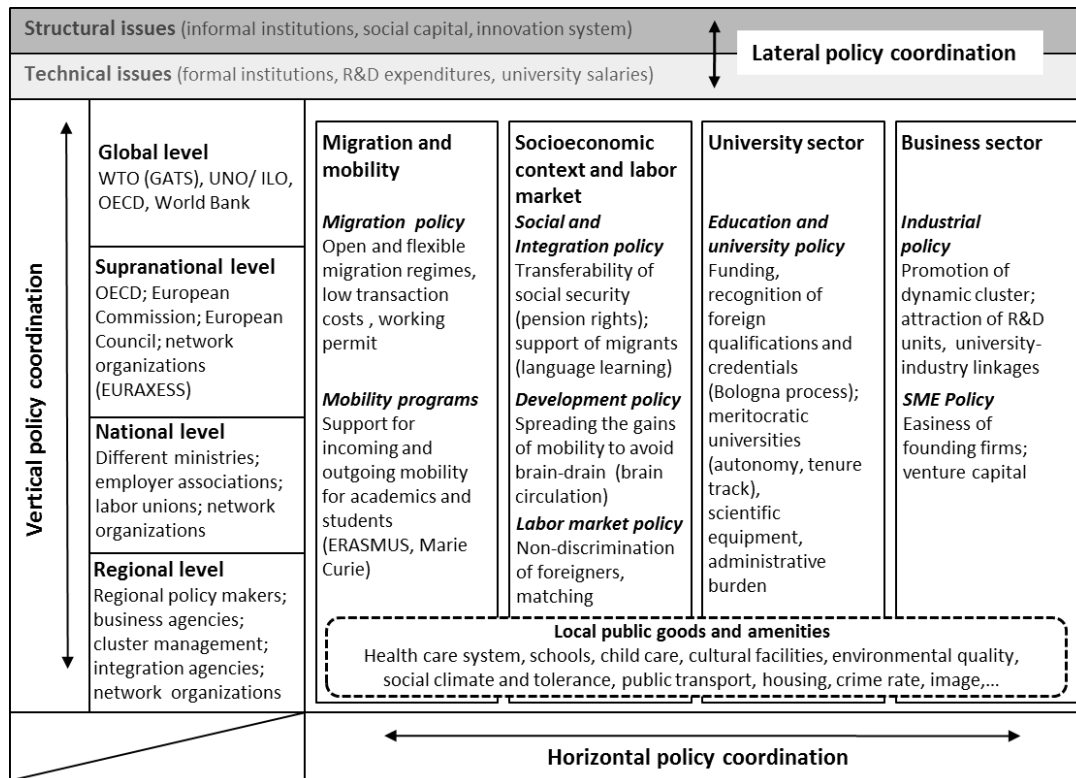
work, depending on the type of human capital in question (Asheim and Hansen, 2009). Regarding academic talent, it is useful to distinguish between students and university researchers (postdocs and professors), although soft location factors such as housing (Glaeser, 2005; van Geenhuizen and Nijkamp, 2007), amenities (Knapp and Graves 1989; Glaeser, 2011), tolerance or low barriers to entry the urban society (Florida, 2002; 2007) are of relevance for both groups.

Student's choice of a particular university and city can be understood as a decision under uncertainty. Equally important for the urban economy is the decision of the student after graduation to enter or not to enter the regional labour market. Empirical research has identified a number of push and pull factors which are the main determinants of these location choices. We will concentrate here on pull factors, because policy makers interpret them as location factors suitable for policy intervention. Descriptive analysis from the OECD (2011) shows that – inter alia – English as a language of instruction, tuition fees, cost of living, immigration policy, mobility programmes and the quality of university courses are important. The importance of quality considerations is also corroborated by econometric evidence for the EU and OECD countries (van Bouwel and Veugelers, 2009; Brezis and Soueri, 2011). The decision to enter the regional labour market after graduation is less well researched but labour market economists and common sense suggest that labour market regulations regarding entry, job opportunities, matching between required qualifications and labour market demand, relative wages, unemployment rates and living conditions are important issues (Borjas, 2010).

Research on the mobility decisions of professors and postdocs shows that wage differentials are of less importance compared to other groups of highly skilled such as managers or engineers (Mahroum, 2000). More important pull factors are the proximity to “star scientists”, institutional prestige, research environment, degree of autonomy, research infrastructure, career opportunities and meritocracy (tenure track) and English as main language (Reinstaller et al. 2012, OECD 2008, Solimano 2008). The technology intensity of the regional business sector and entrepreneurial opportunities may be important determinants for postdocs considering also a career as corporate researcher or for academics working in scientific fields which depend heavily on industry funding such as pharmaceuticals (Thorn and Holm-Nielsen 2006). Potentially important conclusions for policy makers are provided by the analysis of mobility barriers for university researchers. A recent survey of European university researchers reveals that the availability of childcare facilities as well as affordable housing matters (Reinstaller et al. 2012).

The policy matrix in Figure 1 gives a broad but succinct picture of relevant policy fields and governance issues associated with the before mentioned pull or location factors regarding the attraction of academic talent. What makes BCP a rather complex endeavour is the fact that each of these location factors are associated with several policy fields which are organised by different forms of multilevel governance (Sanz-Menendez and Cruz-Castro, 2005). Comparable with other emerging policy issues such as innovation policy, an increasing complexity of policy actions and strategies emerges cross-cutting several formerly rather isolated policy fields.

Figure 1: A policy matrix for BCP



Source: adapted from Reiner (2010)

As a result of the complex governance structure, coordination tasks are an important part of BCP. Figure 1 highlights three of them: (1) vertical policy co-ordination at different spatial levels, (2) horizontal policy co-ordination between different policy fields, typically associated with different ministries and institutions, (3) lateral policy coordination between structural issues and technical issues (Mahroum, 2005). Structural issues are shaped by tradition and culture (e.g. meritocracy, xenophobia, attitudes towards technology and research, etc.), technical issues are under the direct control of policy makers (e.g. immigration regimes, taxation, etc.). Of course, changing structural issues such as the level of tolerance in an urban society is complex and may take a long time.

Considerations of the different policy fields in Figure 1 suggests that, depending on the design of the federal system, urban policy makers may be more powerful in shaping some pull factors for academic talent than others (Alecke et al., 2011). City councils probably have more power in integration and labour market policy or industrial and SME policy. Particularly, they have direct control over location factors such as local public goods and amenities. Accordingly, “quality of life policies” (Glaeser and Kerr, 2010) to improve the quality of local public goods such as environmental quality, schools or childcare facilities may figure prominently on the agenda of urban BCPs. On the other hand, urban and regional governments also face several important institutional and financial constraints in undertaking BCP. For instance, migration issues are traditionally a core competence of the nation state. Another example are university policies, which are predominantly under the responsibility of the national level with the notable exceptions of the US, Germany and Switzerland. However, recent research in regional public policy suggests that - following a trend for regionalisation and decentralisation in Europe - even in the case of migration or university policy room for manoeuvre at the regional level exists (Sanz-

Menendez and Cruz-Castro, 2005). There are already some regional elements present in migration policies with regional entities defining which type of human capital should be granted preferred access to the regional labour market etc. (Burkert et al., 2007; Leo and August, 2009). This element of regionalisation characterises the Austrian ‘Red-White-Red-Card’ as well as the already abolished German ‘Green Card’ (see below). Additionally, the realisation of the European Single Market with the freedom of movement for people from EU-27 countries reduced the importance of national migration rules significantly. Universities are increasingly influenced by regional policies and vice versa (Lawton Smith, 2007; European Commission, 2011). Even though regional governments may fund only a small share of the university budget, they can, for instance, incentivise specialisation patterns to match university research with business sector demand.

Concluding this section on competitiveness policies for human capital it is warranted to undertake some welfare considerations. The main argument is that the city population is better off by attracting mobile human capital because (1) economic growth will increase, (2) human capital driven growth favourably impacts on public budgets because high skilled individuals earn higher wages, pay more taxes and receive less social spending and (3) inequality decreases as a result of complementarities between high and low skilled employment and the compression of wages of the highly skilled (Chiswick, 2011). Locational competition for human capital and associated policies, however, induces also some adverse welfare effects (Peck, 2005). Firstly, empirical analysis sheds light on the dynamics whereby innovation driven growth triggered by international academic talent increases localised wage polarisation as a result of a dual labour markets for low skilled and highly skilled (Lee, 2011). Secondly, tax burdens may be reduced for mobile human capital and redirected towards the immobile factors (i.e. low skilled labour) or consumption. In the extreme case, redistribution via taxes becomes impossible and mobile human capital pays only a benefit tax. Yet, in Europa important tax rates are traditionally set by the national government. Secondly, Borck (2005) points out that public spending might be distorted with asymmetric welfare impacts. Jurisdictions that try to attract mobile human capital will increase their relative spending on public goods that differentially benefit this group. For example, policy makers may decide to “overprovide opera houses relative to public housing, since the former attract mobile workers while the latter does not” (Borck, 2005 490).

3 Brain Competition Policies in comparison

This section introduces case studies and analyses the BCP in Vienna and Munich in a comparative way. Limitations of comparable data occur due to different categorisation of Munich (NUTS 3) and Vienna (NUTS 2) in European regional statistics.

Table 1 displays regional economic and innovation performance indicators for Vienna and Munich. Munich is more productive and R&D-intensive than Vienna, despite some catching up of the Austrian capital in the last two decades. Due to the relatively large and knowledge intensive manufacturing base, the Munich region displays a higher number and share of R&D personnel and a higher number of patent applications. After 1945 Munich became a location for headquarters of multinational and R&D-intensive firms such as Siemens, BMW, Wacker Chemie or EADS. These firms play a very important role in the urban innovation system and attract international talent. Vienna, on the other hand, was a stagnant city until the 1980s with closed borders to traditional export markets in Eastern Europe. Economic dynamism returned and internationalisation increased only after 1989 with the collapse of communism in neighbouring countries and the new role of Vienna as location for regional headquarters in a reunited Europe. Since then, Vienna functions as a hub between Eastern and Western Europe. This role is even visible in the flow of academic talent: outflows of Austrian academic talent are directed towards the US or UK whereas incoming talent are dominantly from Eastern Europe (Meyer et al. 2012).

Table 1 Indicators of innovation performance in Vienna and Munich 2009

	Vienna	Vienna Region ¹	Munich	Munich Region ²
Population in 1,000	1,693	3,300	1,329	4,341
GDP pc in PPP ³	38,977	-	57,749	-
R&D intensity	3.95%	2.98%	-	4.63%
Share of highly-skilled	26%	-	-	33%
Share of R&D personnel on total employment	2.54%	1.50%	-	2.85%
Share of manufacturing employment ³	8.4%	11.1%	-	14.6%
Patent applications to the EPO per Million inhabitants	61	60	242	244

¹NUTS 2 Lower Austria and Vienna

²NUTS 2 Oberbayern

³2008

Source: Statistik Austria, Statistik München, Eurostat, Mayerhofer et al. (2010)

Policy analysis of BCP faces two methodological problems: Firstly, it is difficult to identify relevant policy actions because they are very diverse and scattered among different policy actors and institutions. Secondly, a classification has to be developed, which categorises possibly relevant policy actions as being part or not being a part of BCP. Regarding the first problem, we conducted an

encompassing literature research on policy documents and complemented and validated the results due to qualitative interviews with key policy makers in Vienna and Munich. Concerning the second problem, we distinguish between “explicit” BCP which follow the aim to attract academic talent and “implicit” BCP, i.e. those policies which do not explicitly aim for the attraction of international academic talent but are assumed to be important from a theoretical and conceptual perspective. To add analytical content to the analysis we tried to apply some of the categories of the BCP framework and structured policy actions according to objectives, instruments and actors (Howlett et al., 2009). However, the methodological problems necessarily compromise a clear cut and comprehensive application of the conceptual framework. The multi-level governance of BCP is acknowledged by taking into account related policy actions at national and EU level. Importantly, Munich and Vienna have different functions and positions in the national federal system of Germany and Austria respectively. From a legal system point of view Vienna is situated one level below the national state (NUTS 2) while Munich is already two levels below the national level (NUTS 3) and its competencies and resources are much more restricted. The federal state of Bavaria, of which Munich is the capital city, is the functional equivalent to Vienna. As a result, the public budget of Vienna (about 11,5bn Euro) is more than two times the budget of the city of Munich (5,2bn Euro). In order to account for this different position of the two cities in the federal systems, we consider Munich and Bavaria together and compare their BCP to the one of Vienna.

Additionally, university policy, one of the main channels through which policy makers try to increase the attractiveness of their jurisdiction for international academic talent, is also organised in different ways in Austria and Germany. In Austria, universities are nationally funded and governed whereas in Germany federal states are responsible for university policy. As a result, Bavaria brings more leverage to bear on their universities than Vienna, which tries to influence and complements national university policy via several instruments. Both factors lead to the conclusion, that Munich and Vienna are characterised by different constraints regarding legal, political and financial latitude and resources. In the following, we discuss EU, national and urban policies and systematically compare urban BCP between Vienna and Munich.

EU level and national policies

On EU level, several instruments were implemented to increase the attractiveness and competitiveness of Europe for native and foreign academic talent. Examples include the Scientific Visa or the Blue Card scheme. The Scientific Visa enables third country residents to come to Europe if they are in possession of a signed hosting agreement of a European research organisation. The Blue Card Scheme more generally aims to attract talent to Europe. Talents from third countries must have a higher education qualification and a valid work contract or binding job offer in the EU to apply for the Blue Card. The Blue Card has been introduced by Member States with room for amendments from national governments. An important driver of student and academic staff mobility is the European Erasmus programme, which is in place since 1987 with 33 countries participating in 2012.

At the national level Austria and Germany are characterised by a long record of restrictive immigration policies (Ette and Sauer, 2010; Reiner 2009). For instance, Austria and Germany applied for restrictions on the free movement of labour from the new member states which joined the EU in 2004 and 2007 until 2011; no other EU country restricted migration for such a long time period. Probably as a result of these policies, they are both characterised by rather low shares of tertiary educated people in general and by relatively low shares of highly skilled foreign-born among total foreign-born population compared to other OECD countries in particular. In comparison to the share

of highly skilled foreigners in Canada (38%), the UK (35%) or the US (26%), Austria (11%) and Germany (15%) seem to be rather unattractive destinations (Huber et al., 2010). However, both countries tried to improve their attractiveness for foreign talent recently. Austria founded Brainpower in 2004, a nationally funded service and information platform which supports international researchers and national expatriates intending to move to Austria. Similar vehicles exist in Germany (GAIN) or Switzerland (Swiss Talents). Furthermore, Austria introduced in 2011 the Red-White-Red-Card facilitates the immigration of qualified workers from non-EU countries according to personal and labour-market related point-based selection criteria (BMASK, 2010). Germany relaxed restrictions for selected migrant groups as well (Ette and Sauer, 2010). In 2000 the German “Green Card” for IT specialists was introduced, but already cancelled in 2003 (Bauer and Kunze, 2003). The number of applications and assignments were disappointing due to unattractive conditions and weaknesses in the administrative system. The revealed lack of competitiveness in attraction of foreign IT-talent induced a broader discussion on migration policy in Germany. One outcome of this was the German Immigration Act which came into force in 2005, granting permanent residence and permission to work for highly qualified with an easier access to visa and a reduced burden of bureaucracy.

Vienna

Vienna issued a research, technology and development strategy in 2007 which states explicitly the aim to increase the locational attractiveness for academic talent. To this end, a set of instruments have been introduced which systematically foster the attraction of researchers on different stages of their career (Table 2). Endowed professorships aim to attract international senior researchers working in fields of science corresponding to regional economic strengths. An international postdoctoral programme supports postdoctoral researchers to develop their own research group. There also exists a programme to attract young international researchers to Vienna. Fellowship grants enable international researchers to spend a couple of months at Viennese research organisations as guest researchers. Summer schools are financed to attract international students or PhD students.

The main actors to develop and implement BCP-policies are the city administration, the ‘delegate for university and research’, the Vienna Science and Technology Fund (WWTF) and a Technology Promotion Agency (ZIT). Some of the instruments and agencies are organised and financed in cooperation between Viennese, national and private institutions.

Beside the already mentioned explicit policies to attract foreign academic talent, urban policy makers in Vienna have applied a number of instruments which shape and upgrade soft locational factors since decades. While these policies are not actively promoted as part of an encompassing BCP they clearly increase the locational attractiveness of Vienna (implicit BCP). Important examples include housing policy, urban environmental policy or subsidies for cultural activities. Social housing policies, for instance, reduce upward pressures on rents, provide mixed neighbourhoods and reduce crime rates. Additionally, students from EU countries can apply for social housing under certain circumstances.

Vienna possesses the financial and to a lesser degree the legal power to set up agencies and instruments not at least because Vienna enjoys the administrative status of a federal state. Policy makers in Vienna deliberately engage and develop different explicit and implicit policy instruments which can be classified as being part of an emerging BCP. Most of the explicit policies are targeted towards international university researchers and much less towards international students. Yet, the share of international students in Vienna is already high and student flows seem to be determined predominantly by national and EU policies (see below). Our findings indicate two fields of urban policy in which Vienna displays room for improvement. Firstly, urban level university policies should

be expanded in order to position Vienna more forcefully as an attractive city for foreign academic talent. Recently, a 'delegate for university and research' from the Viennese government was appointed to step up the engagement of the city of Vienna in this direction. Secondly, the European Value Study (EVS) delivers an international comparison of perceived societal values regarding politics, religion, labour, family and migration. The survey from 2008 revealed that Austria has the highest antipathy against foreigners, Germany takes the eighth position out of 45 countries (Polak, 2011). A rather uneasy level of xenophobia is also mirrored in the city parliament in Vienna, where 27% of the delegates are members of the populist right wing party FPÖ. A recent Eurobarometer survey on the quality of life in 75 European cities corroborated these results (European Union, 2010). Out of the 75 cities, Viennese citizens show the second lowest approval rate on the question, if foreigners are well integrated (26%; Munich: 50%). As a reaction, the coalition government of the Social Democrats and the Green party enacts several initiatives to increase the level of tolerance and openness in the urban society.

Table 2: Explicit brain competition policies in Vienna

	Policy documents	Objectives	Instruments	Actors
Vienna	<ul style="list-style-type: none"> ▪ Wiener Strategie für Forschung, Technologie und Innovation, 2007 (Research, Technology and Development Strategy for Vienna) ▪ Migration, Mobilität, Vielfalt, 2010 (Migration, Mobility, Diversity) ▪ Leitlinien der Wiener Integrations- und Diversitätspolitik, 2009 (Master profile for integration and diversity policy in Vienna) 	<ul style="list-style-type: none"> ▪ Becoming one of the most important European R&D metropolitan regions and the principle town for R&D in Central Europe ▪ Increasing attractiveness for the best brains ▪ Developing an integration oriented diversity policy ▪ Easing the settlement of international high-qualified and their families in terms of living, working and educating 	<ul style="list-style-type: none"> ▪ Endowed professorships for international researchers funded for universities in Vienna ▪ Vienna International Postdoctoral Programme (VIPS), 3-years postdoc positions for researchers in specific disciplines from abroad funded by the city of Vienna and the science ministry ▪ Research Groups for international young Investigators to develop a research group ▪ Fellowships Grants for international senior and junior research in humanities for short-term stay ▪ Summer schools for young researchers ▪ Regular diversity and integration monitoring 	<ul style="list-style-type: none"> ▪ City of Vienna: <ul style="list-style-type: none"> - Administrative Group of Finance, Economic Policy and Vienna Public Utilities - Administrative Group for Cultural Affairs and Science - Administrative Group for Integration, Women's Issues, Consumer Protection and Personnel ▪ Delegate of the city of Vienna for University and Research ▪ Vienna Science and Technology Fund (WWTF) ▪ Technology promotion agency of the city of Vienna (ZIT) ▪ Vienna Migration Commission ▪ Regional employment agency, chamber of commerce, labour unions

Source: Stadt Wien 2007, Wiener Zuwanderungskommission, 2010; Stadt Wien, 2009

Table 3: Explicit brain competition policies in Bavaria and Munich

	Policy documents	Objectives	Instruments	Actors
Bavaria	<ul style="list-style-type: none"> ▪ Koalitionsvereinbarung 2008-2013, 2008 (Coalition agreement) ▪ BayernFIT – Forschung, Innovation, Technologie, 2008 (Research, Innovation and Technology in Bavaria) 	<ul style="list-style-type: none"> ▪ Attracting star scientists with Bavarian roots to return to Bavaria 	<ul style="list-style-type: none"> ▪ Scholarships for international postdocs ▪ PhD programme with strong international orientation (incomings and outgoings) ▪ Scholarships for international PhD students for 3 years ▪ Scholarships for researchers from strategic partner countries (China and India) ▪ Scholarships for international students ▪ Study programme for graduates from Eastern European countries at universities in Bavaria 	<ul style="list-style-type: none"> ▪ Bavarian State Ministry of Sciences, Research and the Arts ▪ Bavarian Research Foundation
Munich	<ul style="list-style-type: none"> ▪ München – Stadt des Wissens, 2005 (Munich – city of knowledge) ▪ Interkulturelles Integrationskonzept, 2008 (Intercultural integration concept) 	<ul style="list-style-type: none"> ▪ Attracting and keeping talent in Munich ▪ Establishing integration as a cross-policy field 	<ul style="list-style-type: none"> ▪ Controlling- and monitoring of integration 	<ul style="list-style-type: none"> ▪ City of Munich: Department of Labour and Economic Development and Department of Social Affairs

Source: Bayerische Staatsregierung, 2008; Landeshauptstadt München Referat für Arbeit und Wirtschaft, 2005; Landeshauptstadt München Referat für Arbeit und Wirtschaft, 2012; Landeshauptstadt München Sozialreferat, 2008; Christlich Soziale Union and Freie Demokratische Partei Bayern, 2008

Bavaria and Munich

The current coalition agreement of the Bavarian government (2008-2013) foresees the development of new programmes to attract star scientists with Bavarian roots to return to Bavaria (Christlich Soziale Union and Freie Demokratische Partei Bayern 2008, 19). This has been turned into university performance contracts by the federal research ministry (Bayerisches Staatsministerium für Wissenschaft, Forschung und Kunst, 2008). The Bavarian Research Foundation offers scholarships for international students, PhDs and postdoctoral researchers (sometimes only from strategically important countries like China or India). However, the Bavarian programme on research, innovation and technology does not explicitly focus on the attraction of academic talent (Bayerische Staatsregierung, 2008).

The report on “Munich – city of knowledge” (Landeshauptstadt München Referat für Arbeit und Wirtschaft, 2005) identifies the attraction of talent and increase of stay rates in Munich as one of the strategic fields but no specific instruments have been introduced to enforce the attraction of academic talent hitherto (Table 3). Furthermore, the annual economic report of Munich states that “active innovation policy is no task of the urban municipality” (Landeshauptstadt München Referat für Arbeit und Wirtschaft, 2012 26). According to the city administration this is true for research policy as well, in particular BCP. One of the reasons for the absence of an explicit and developed urban innovation policy in Munich are the restrictive financial resources, which forces the city administration to focus solely on network and coordination activities of research actors (Fischer, 2011). Moreover, city officials emphasise that research organisations in Munich are financially and legally sufficiently powerful to introduce their own instruments. The University of Munich e.g. has introduced a dual career system for couples, especially from abroad, which includes career and integration services (e.g. career coaching, information on employers in the region, search for housing, search for childcare etc.). Furthermore, a set of endowed professorships are each year sponsored by companies, which reflects the R&D intensity of the regional business sector. Like Vienna, Munich applies several policies which increase the attractiveness of Munich for international academic talent without being conducted under this heading. For instance, Munich has introduced an intercultural integration concept in 2008 to better utilise internationals for the urban economy.

Comparison

The urban government of Vienna is conscious of the fact that BCP is important for the competitiveness of the urban economy. This is corroborated by the fact that the attraction of academic talent was integrated into strategic policy documents and by the implementation of specific programmes. Furthermore, Vienna operates a number of implicit BCP such as housing or cultural policy.

Although the government of Munich pays attention to this issue, it decided not to actively develop BCP. These are seen as the responsibility of universities and research organisations. Although the Bavarian strategy on research, innovation and technology does not state the aim of

attracting international academic talent explicitly, Bavaria has introduced a few instruments to attract international researchers.

Vienna and Bavaria apply explicit BCP for university researchers only. Students are generally not targeted by explicit policy actions. Yet, both cities perceive their policies on soft location factors such as amenities, tolerance or housing as being important for students in their location decision as well. Table 4 compares Munich and Vienna based on the results of the annual city ranking of The Economist Intelligence Unit (EIU) focusing on urban liveability and comparing soft location factors across cities. The 2010 ranking encompasses 140 cities. It is led by the city of Vancouver and followed by Vienna, whereas Munich is listed on the position 28. On a scale from 1-100 (100 correspond to ideal) different aspects of liveability are measured: stability, healthcare, culture and environment, education and infrastructure. Vienna and Munich display high scores in all five categories and prove to be attractive places to live. Munich ranks slightly lower due to lower scores on stability (related to crime and violence), education and infrastructure (especially the regional and international linkages and the availability of housing). Results from previous rankings from the Economist Intelligence Unit and similar city rankings confirm the robustness of the presented results (e.g. UNO Habitat, 2012; Mercer Quality of Living Survey). Comparing the costs of housing, Vienna is cheaper than Munich, which is the most expensive city regarding housing in Germany (UBS, 2012; Döll and Stiller, 2010). However, the level of openness and tolerance is higher in Munich. For instance, the share of right wing parties in the city parliament of Munich is negligible (1.25%) compared to Vienna (27%).

Table 4: Soft factor for the attractiveness of cities according to the EIU Global liveability survey

	Vienna	Munich
Liveability rank (out of 140 cities)	2	28
Liveability rating (1-100, 100=Ideal)	98	93
Stability rating ¹	95	85
Healthcare rating ²	100	100
Culture & Environment rating ³	97	97
Education rating ⁴	100	92
Infrastructure rating ⁵	100	89

Source: EIU Liveability survey, 2010

¹ Prevalence of crime, violence and terrorism

² Availability and quality of public and private healthcare

³ Climate, corruption, censorship, social/religious restrictions, sports, culture and food/drinks

⁴ Availability and quality of public and private education

⁵ Quality of public transport, quality of regional or international links, availability of good quality housing, quality of energy, water, telecommunication provision

Comparing explicit BCP between the two cities, Vienna is much more active in this newly emerging policy field compared to Munich and Bavaria. Important explanations for this difference can be found in the distinctive historical trajectories of these cities and different

national policies. Munich is a well-established location for high-tech industries since decades and local firms play an important role in the sponsoring of endowed professorships. On the national level Germany and Austria spend roughly the same amount in tertiary education but German universities can apply for additional funding from the “Exzellenzinitiative” which allocates significant resources primarily from national funds to selected universities between 2006 and 2017. The University of Munich (LMU) and the Technical University are one of the main beneficiaries of this initiative which enables them to invest heavily in cutting edge infrastructure and doctoral colleges.

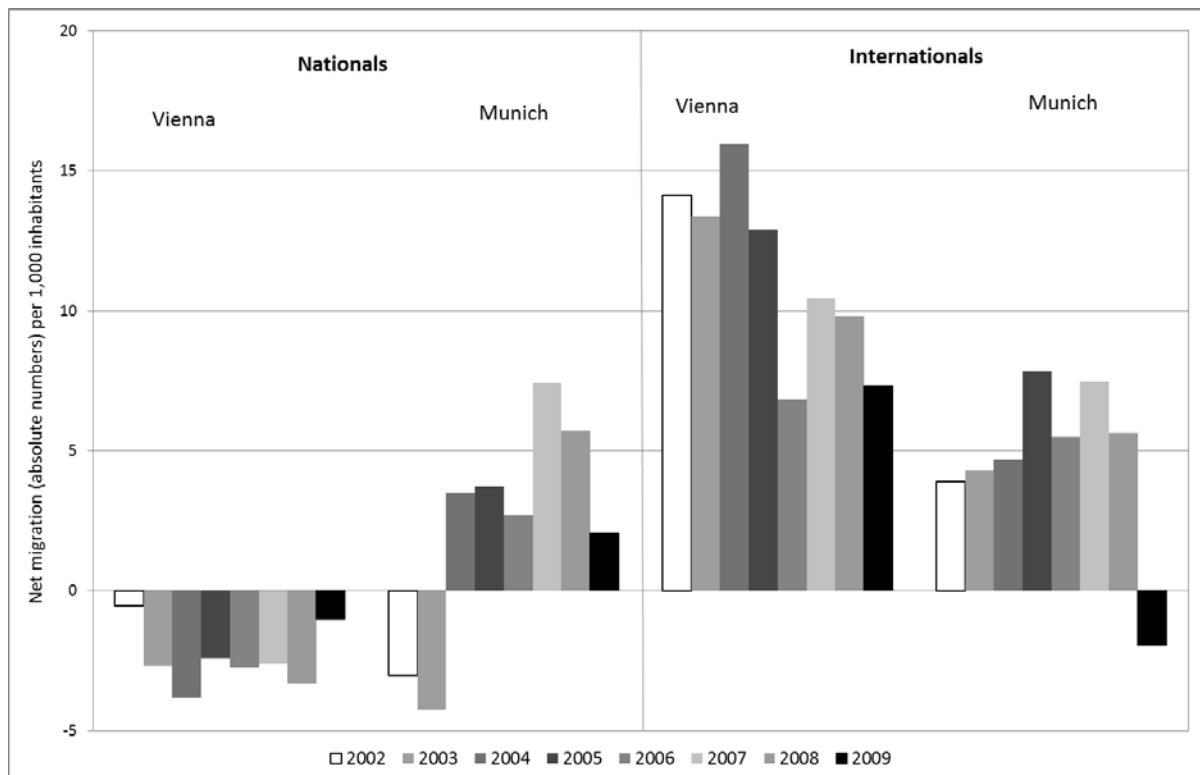
Vienna, on the other hand, is still in a catching up process compared to Munich in terms of R&D intensity and GDP. So far no established culture of private funding of firms for universities exists. Additionally, Austrian universities are in a continuous struggle to finance even their basic infrastructure and teaching obligations. The Austrian funding for excellence research is steered predominantly towards a few newly established researcher institutes such as the Institute auf Science and Technology Austria (ISTA) or the Institute of Molecular Biotechnology (IMBA). We hypothesise, that the greater activism of the Viennese policy makers in BCP can be interpreted partly as a substitution process typical for catching up processes, whereby policy makers intervene with greater emphasis in the innovation system (Tripl and Tödting, 2007). Another important explanatory factor is given by the different role of Vienna in the federal system compared to Munich. Thus Vienna experiences a greater leeway regarding monetary resources and legal competencies.

4 Empirical evidence on locational attractiveness for academic talent

What are the outcomes of the policies described in the previous section? While it seems almost impossible to answer this question in a rigorous way, we try to give some empirical informed intuition on the success of different policies. Doing this, we are aware of the fact that policies are only one factor which impacts on mobility and location decisions of academic talent. Due to data limitations in some cases, national data have to be used instead of regional data.

On aggregate level, the increasing dependency of Vienna and Munich on internationals is obvious when looking on the share of international inhabitants over time. The share of foreigners in Vienna increased from 16% in 2000 to 22% in 2011. In Munich the share of international inhabitants accounts for 23% in 2011 and has only slightly changed over time. The migration statistics of Vienna and Munich between 2002 and 2009 show a positive net migration of internationals. In Vienna international migration has a positive balance, whereas national migration has a negative sign. In Munich national and international migration has a positive balance, but international migrants count for the higher number (Figure 2).

Figure 2: National and international migration balance 2002-2009 in absolute numbers per 1,000 inhabitants



Data: Statistik Austria, Statistik München

Internationalisation of the labour force has also increased. Employment statistics reveal that the share of internationals employed is constantly rising in Vienna (Munich), starting in 2000 with 14% (21%) to 19% (22%) in 2010. Munich and Vienna are those regions with the highest share of international employment in Germany and Austria respectively (Döll and Stiller, 2010).

Vienna (Munich) hosts nine (three) public universities. Most of the students study at the classical universities (University of Vienna, University of Munich) or the technical universities (Technical University of Vienna, Technical University of Munich). Table 5 illustrates the performance of the two largest universities in Vienna and Munich respectively. The University of Vienna is the largest German speaking University with more than 90,000 students. However the number of professors and budget per student are higher in Munich. The slightly better performance of Munich in terms of education can be confirmed by the Times Higher Education Ranking, where teaching indicators play a major role (30%). The Shanghai Ranking includes indicators mainly mirroring the research quality (publications, citations, Nobel Prize winners, etc.). Munich universities again perform better than Viennese universities. From this point of view universities in Munich might be more attractive. Anecdotal evidence indicates that wage levels are quite similar between the University of Vienna and the University of Munich but research infrastructure availability is relatively better in Munich not at least because of additional national public funding from the already mentioned “Exzellenzinitiative”.

Table 5: University performance indicators 2011

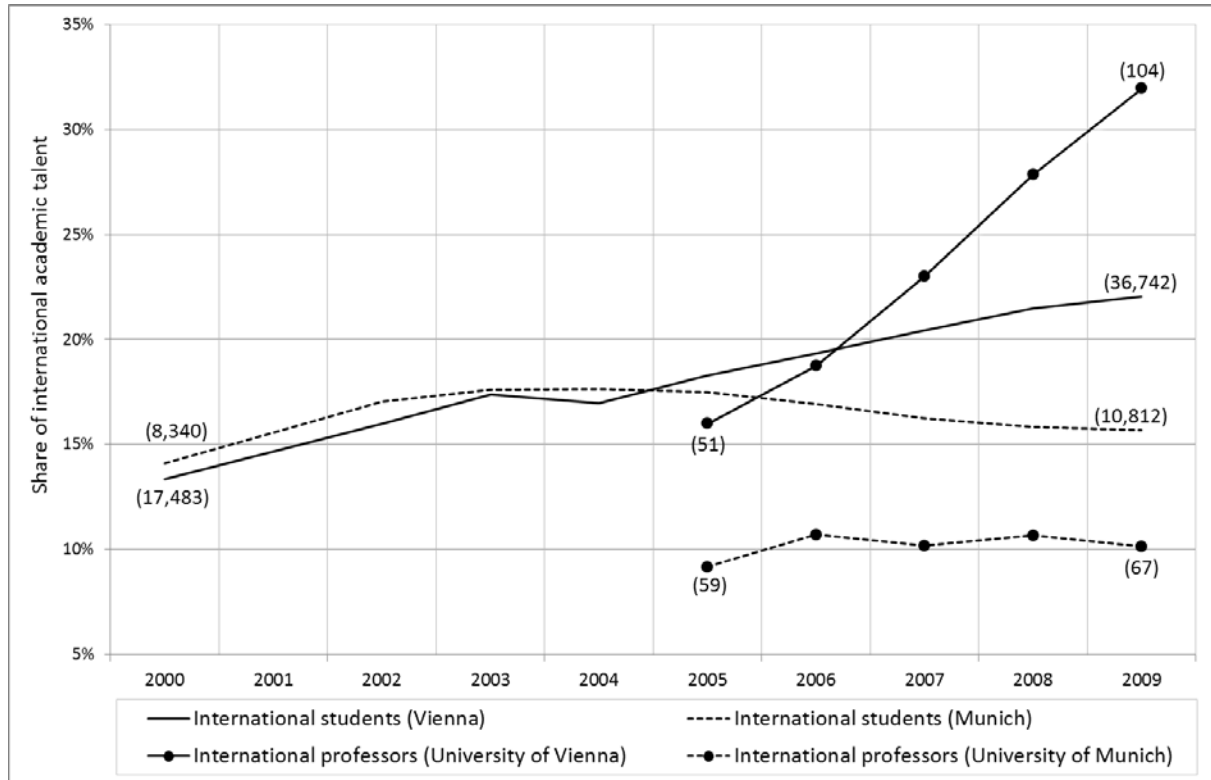
	Vienna		Munich	
	University of Vienna	Technical University Vienna	University of Munich	Technical University Munich
Number of Students	91,362	25,838	49,180	31,023
Share of international students	25%	24%	14%	16%
Number of Professors per 1,000 student	4.25	5.30	14.92	15.31
Budget per student	5,571	-	9,943	-
Position in Times Higher Education	139	301-350	45	88
Position in Shanghai Ranking	151-200	401-500	54	47

Source: University of Munich, Technical University Munich, University of Vienna, Technical University Vienna, Shanghai Ranking, Times Higher Education Ranking

Regarding the internationalisation of academic talent, Figure 2 presents the share of international students and professors in Vienna and Munich. In both cities an increasing share of students is of foreign nationality: Between 2000 and 2009 their share increased in Vienna from 13% to 22%, whereas Munich shows a rise from 14% to 16%. In recent years, especially Viennese universities attract an increasing number of students from abroad, mainly from Germany, Italy and Turkey and Eastern European countries. The internationalisation of professors has also rapidly increased in Vienna. In 2005 about 16% (9%) of professors had a

foreign nationality at the University of Vienna (Munich), in 2009 this share has raised to 32% (10%). Again most of the international professors at the University of Vienna come from Germany. Their share has increased strongly since 2005, whereas the share of professors of other nationalities remained constant.

Figure 3: Share of international students and professors in Vienna and Munich



Data: BMWF uni:data, Destatis, University of Munich, University of Vienna

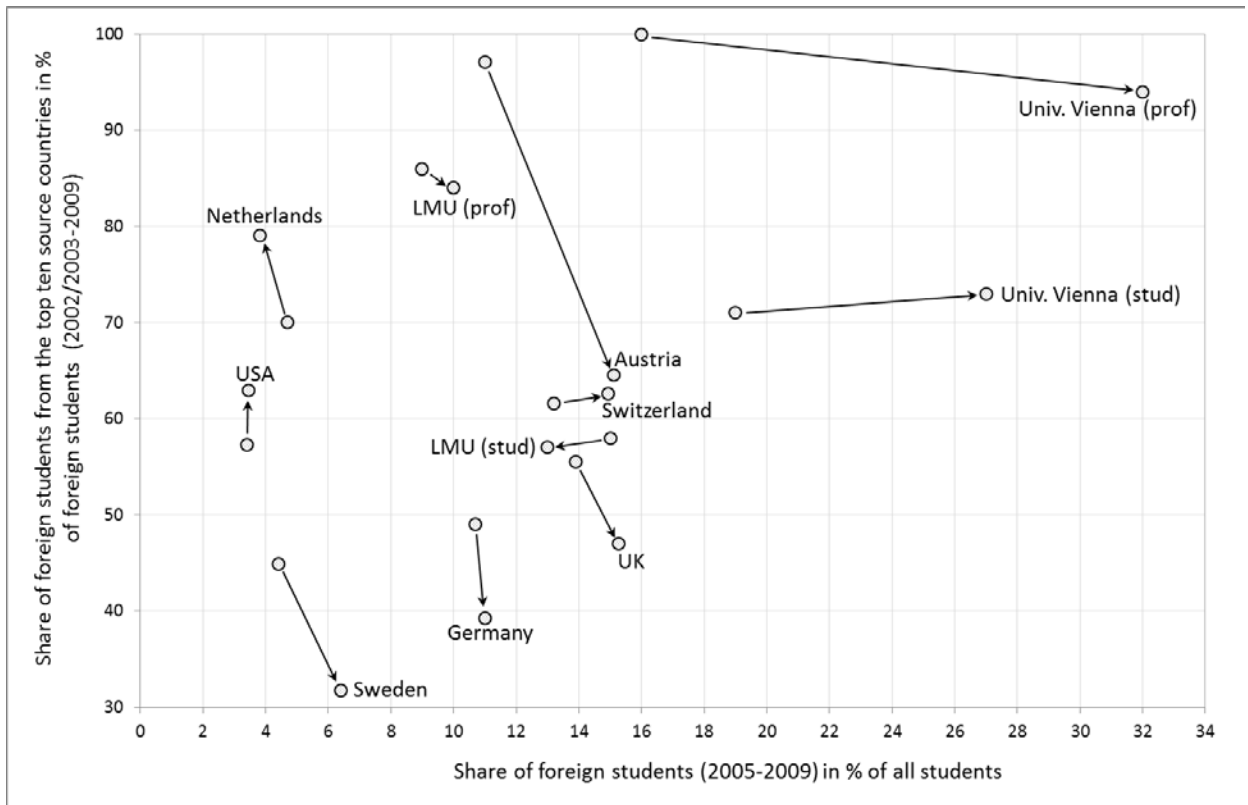
Although Vienna counts for a large number of international students, they do not come necessarily in the search for excellence in research and teaching to Austria and their stay rates after graduation are relatively low. This argument is corroborated by the decisions of German students, which account for about one third of foreign students in Vienna. Their motivation to choose to study in Vienna depends on two factors: Firstly, admission to German universities is generally restricted by a numerus clausus regulation, whereby only a limited number of students with best grades at school receive an acceptance to study at a German university. This is not the case for Austrian universities where German students who did not pass the numerus clausus are allowed to study anyway. Until 2005 the Austrian government restricted access to national universities for German students to those who passed the numerus clausus but this regulation was abolished by the European Court of Justice because of concerns on discrimination between Austrian and international students. Consequently, a fraction of international students from Germany may represent a negative selection compared to those who study in Germany. Secondly, in some Germany states, including Bavaria, tuition fees must be paid which is again

not the case for Austria. Historical ties, cultural proximity and spatial proximity are additional factors which explain the large share of German students. Notably, none of these factors can be influenced by Viennese policy makers. The general structure and size of student flows are determined by EU law and national university policies. If there is any measureable impact of urban BCP it may be small and difficult to disentangle from other policies. Contrary to the German students, Eastern European students are attracted by the better education system and living conditions in Vienna compared to their home country.

The decision of international students to stay after graduation reveals important elements of the attractiveness of a city. Statistics on the stay rate of non-EU graduates reveal that only 17% of students stay after graduation in Austria (OECD, 2011). This is low compared to Germany 25%, Canada 33%, Australia 30% or the Netherlands 27%. Although the Red-White-Red-Card in Austria allows international graduates of Austrian universities originally from non-EU countries to stay for six months to find a job since 2011, the effect of this regulation in terms of number of applications (17% of international graduates mainly from Eastern Europe and Asia) is below expectations (BMASK, 2010). So far only Master graduates can apply for the Red-White-Red-Card, Bachelor graduates are excluded. Universities and the conservative party as part of the coalition government lobby for the extension of the card for Bachelor graduates but the social democratic party and unions are against it (Die Presse, 2012a; 2012b).

The development of the share and diversity of international students for selected countries and the universities in Munich and Vienna differentiated by students and professors are shown in Figure 4. For countries, data on international students are used. Diversity is measured as the share of international students from the top ten source countries, i.e. the higher the share the lower the diversity. A high concentration on a few source countries might be interpreted as a sign of weaknesses in the competition for academic talent. Traditional migration nations like the UK or the US indicate a higher share of international students from a variety of countries. In 2002 Austria is characterised by a very high share of international students and a relatively low diversity. However, a substantial dynamic set in afterwards and Austria displays a strong increase in the diversity of international students. Germany is characterised by high diversity and a lower internationalisation compared to Austria. The urban level mirrors the national picture in the sense that the academic talent at the LMU is more diverse than that of the University of Vienna but its share is lower. Contrary to the national trend, diversity of students and professors at the University of Vienna show only small signs of change. This can be explained by the strong increase in the number of German students and professors in this time span.

Figure 4: Development of the share and diversity of international academic talent (2002/2003/2005-2009)¹



¹LMU: University of Munich; Univ. Vienna: University of Vienna; prof: professor; stud: students
 Data: Ederer et al., 2008; BMWF uni:data, Universität München, Destatis, OECD

5 Conclusion

International academic talent is a small, but important fraction of human capital. We proposed a policy framework denoted as brain competition policy (BCP) which emphasises relevant policy fields for the attraction of international academic talent and governance issues. Several factors influence the mobility of academic talent, with some of them can be influenced by urban policy makers. This is especially true for soft location factors such as housing, childcare, or cultural events. For other policy fields, urban policies are constrained by their legal status in the national federal system. The horizontal coordination of actors of different policy fields and the vertical coordination of different policies carried out at different spatial levels are one of the main issues in developing a smart BCP.

Vienna and Munich, which serve as empirical case studies in our analysis, display quite different policy designs regarding BCP. Vienna is much more active in this newly emerging policy field compared to Munich and Bavaria. Important explanations for this difference can be found in the distinctive historical trajectories of these cities and different national policies. Munich is a well-established location for high-tech industries since decades and local firms play an important role in the sponsoring of endowed professorships. Vienna, on the other hand, is still in a catching up process compared to Munich in terms of R&D intensity and GDP and no established culture of private funding of firms for universities exists. We hypothesise, that the greater activism of the Viennese policy makers in BCP can be interpreted partly as a substitution process typical for catching up processes, whereby policy makers intervene with greater emphasis in the innovation system. Another important explanatory factor is given by the different role of Vienna in the federal system compared to Munich. The function of Vienna in the Austrian federal system is comparable to that of Bavaria.

Similarities between the BCP of the two cities can be observed in terms of their attached importance on the attraction of professors and postdocs. Students are not targeted by specific policy instruments. Policy makers in Vienna and Munich regard their policies on soft location factors such as amenities or housing as being sufficient to position their cities in the international competition for international students. Hence, despite a broad discourse and hype in policy circles and popular media, competing for international students is of rather minor importance for urban policy makers – at least until now in Vienna and Munich.

The analysis of the performance of Vienna and Munich in the competition for human capital shows that both cities benefit from net-inflows of internationals. The share of foreigners is somewhat higher in Munich but progress towards internationalisation was much faster in the case of Vienna. Concerning academic talent, the universities in Vienna exhibit higher shares of academic talent but does not necessarily increase diversity. The latter may be interpreted as a lower competitiveness of the city of Vienna in the competition for academic talent compared to Munich. Strongly increasing inflows of German students since 2005 increase internationalisation but reduce diversity. This process is by and large driven by regulatory arbitrage which enables German students to benefit from free access to Austrian universities. As a result, the increased internationalisation of Viennese universities has to be interpreted

cautiously and not as an uncontroversial proof of the increased attractiveness of Vienna for academic talent.

Notably, none of the factors shaping the general structure of the flows of academic talent can be influenced by policy makers in Munich and Vienna respectively. The general structure and size of student flows are determined by EU law and national university policies. If there is any measureable impact of urban BCP it may be small and difficult to disentangle from other policies. However, it may be revealing to ask the counterfactual question: What performance would Vienna or Munich have displayed in the absence of the implemented explicit and implicit BCP. At least for Vienna, one can speculate that soft location factor policies are important because the mediocre performance and resource endowment of the Viennese universities could not substitute missing urban attractiveness via research or teaching excellence.

It remains to be seen whether BCP gains further importance in future as human capital becomes an increasingly scarce resource. There is still ample room for the development of smart policy instruments and improvement of existing policies. For instance, both cities do not actively engage in promoting brain circulation and supporting international graduates from urban universities in their labour market search process. National policies grant a time span for job search for non-EU internationals which could be complemented by urban policies in order to profit from the positive spillovers associated with an international highly skilled workforce. Stay rates may also be increased due to internships of international students in local firms organised and coordinated by urban government. Successful policies to raise the level of tolerance and openness of an urban society, which are important for cities such as Vienna, require substantial resources and creative public initiatives with uncertain outcomes in the future. Yet, populism and resentment against foreigners is on the rise in times of increasing unemployment under the current financial and economic crisis. A further challenge is given by the development of comprehensive evaluation methods for BCP. Policy learning via comparative policy analysis will play as well an important part in the continuing development of attraction policies for academic talent

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