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Agglomeration and the Case of Germany: How to Help the Lagging East

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Bayerische Julius-Maximilians-Universität Würzburg

Wirtschaftswissenschaftliche Fakultät

**Agglomeration and the Case of Germany:
How to Help the Lagging East**

**Norbert Berthold
Michael Neumann**

Wirtschaftswissenschaftliche Beiträge
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I. Introduction

According to standard tax competition literature, tax competition among countries leads to an inefficiently low level of taxation. Taxes levied by one country impose spillover costs on other countries, if there are any migration externalities at work caused by mobile factors (Zodrow/Mieszkowski, 1986; Wildasin, 1989). A tax base flight into low-tax countries is seen as forcing all governments to choose lower tax rates on mobile factors than their competitors. As a consequence, they engage in inefficient competition for mobile factors. The tax competition is reduced to a “race to the bottom” of the tax rates. This “race to the bottom” is self-reinforcing, because the individual share of the production costs of local public goods decreases with the amount of taxed factor income. Hence, each country that has a larger tax base than other countries is likely to attract more and more of the mobile factor, so being able to reduce its tax rates even further. In these circumstances, a suitable tax harmonisation must result in a pareto-improvement. The underlying conditions of the standard model, however, completely ignore the existence of agglomeration forces and trade costs. The tax competition among countries usually takes the form of a competition to attract industries. Agglomeration forces are important in this respect. There is a new and emerging literature dealing with tax competition implemented in a world full of agglomeration effects (Ludema/Wooton (2000); Baldwin/Krugman (2004); Bork/Pflüger (2004)). These agglomeration models are able to analyse the differences between cases where tax harmonisation is pareto-improving and where it is not.

Based on the new literature, this article depicts the case of Germany today. Germany's convergence process after reunification seems to have met an untimely end. Germany is in great danger of becoming a core-periphery world with a richer West and a poorer and emptier East. The aim of this contribution is to show that the same tax rates in the West and the East are disadvantageous at least for the East. Different tax rates in the West and the East will not result in a race to the bottom as the traditional literature fears, but they can improve the situation particularly for the East.

This non-standard outcome, compared to the traditional literature, is dependent on whether there are agglomeration forces at work or not. This underlines the importance of understanding how the process of locating production and consumption in Germany is going on. Generally, agglomeration can be caused both by technological and pecuniary externalities.

However, technological spillovers – often considered to be more important in the case of agglomeration inside one nation – are not the point to be focused on here. It is not the aim to analyse whether there are successful industries and which they are, and how to attract them. For implementing a tax that does not discriminate between different kinds of industry, it is required to concentrate on the pecuniary externalities only. For this reason, we turn to a model developed on the basic ideas of Krugman (1991).

Pecuniary externalities are usually considered not to cause market failure and welfare losses. Although some authors suggest that a clustering of industries driven by the share of expenditure and not by the share of persons represents a market failure (Baldwin et al. 2003), this does not seem to be completely convincing, because the reasoning relies only on a slight redefinition of market failure. The focus chosen here is therefore not on taxes as an instrument to correct the market results in order to achieve market efficiency. If Western Germany is large enough and all persons are mobile enough, it might be the optimum solution to allow for a crowded West and an empty East, and worth considering at the federal level of the government to accept this result politically. Nonetheless, it is the aim here to focus on how a region (or a *Bundesland*) in the East can work against that.

Firstly, the basic model of the agglomeration process driven by the migration of skilled labour is described relying on a model developed by Forslid/Ottaviano (2003) as it is used in Baldwin/Krugman (2004), but enriching this model with restrictions concerning the mobility of skilled labour (Chapter II). Then the convergence progress in Germany is observed in order to make sure that there is a need for taking up the ideas of the New Economic Geography, particularly of the chosen model. For this it will be examined whether there is enough mobility, who is moving and in which direction (Chapter III). Chapter III also depicts the partial agglomeration of the German case. Furthermore (in Chapter IV), we are adding different tax rates on income in West and East. We show what would happen if the East were free to set its own tax rates. We also discuss the “race to the bottom” problem for Germany briefly. Finally, we review our main results and give some advice for German policy to fight the agglomeration process (Chapter V).

II. The Basic Model

The basic model contains the two German regions, two sectors and two factors. At the beginning, both regions are assumed to be identical in size and factor amount¹. The two factors of production are denoted as creative human capital (H) and workers (L)². L is assumed to be a homogeneous factor earning the wage w_L . The two sectors of the model are called A-Sector and M-Sector. The A-Sector produces homogeneous goods under the conditions of constant returns to scale and perfect competition. Only a certain proportion of a_A of L is used to produce one unit of the goods regardless of the output level. There are no innovations in A. The profit made equals zero. The price of the A-goods is given by $p_A = w_L a_A$.

In the M-Sector, a multitude of diversified goods is produced under monopolistic competition with increasing returns in production. This part of the industry is the innovative one, in which creative human capital can earn high profits. The products of the M-Sector are heterogeneous, each firm produces a variant of its own. Therefore, it is possible to yield a positive profit after paying the wage for L. This profit is earned by the creative human capital. To make things simple it can be assumed that each enterprise is employing exactly one unit of creative human capital. The production of x units of a variety of M involves just one unit of H and $a_M x$ units of L. The price for the input of this human capital is modelled as an amount of fixed costs w . Hence, it is the direct wage of H in the M-Sector. The total costs for producing x units of one heterogeneous good are given by $w + w_L a_M x$.

The representative German consumer has two-tier preferences expressed in:

$$(1) U = C_M^\mu C_A^{1-\mu}, \quad C_M = \left(\int_{i=0}^{n+n^*} c_i^{1-1/\sigma} di \right)^{1/(1-1/\sigma)}, \quad 0 < \mu < 1 < \sigma$$

¹ Neither the territory nor the density of inhabitants in Western and Eastern Germany is of equal size, but this should be interpreted partly as a result of the already ongoing agglomeration. Furthermore, some regions of the West attract many people while the number of immigrants into other Western regions is negligible. This makes it problematic to assume that the attracting regions in the West are larger (or smaller) than the sending regions in the East. Hence, it is more suitable to consider two regions of the same size. We further assume them to be symmetric in terms of tastes for goods, technology, trade costs and factor endowments. By assuming the East to have an older technology and less capital, this would even foster agglomeration towards the West making our arguments stronger. Note that the assumption of asymmetric size with a smaller East leads to agglomeration as well, and compare Baldwin et al. (2003) for a brief description.

² Baldwin et al. (2003) call factor H “entrepreneurs”, but this term is not to be used here. There are many entrepreneurs in Germany having nothing in common with the special factor that is needed to be successful in supplying heterogeneous goods. Their entrepreneurship is often caused by governmental help only – such as by the so-called “Ich AG” – (Sternberg/Lückgen, 2005). Such entrepreneurs are not the factor H.

where C_M is the aggregated consumption of the varieties of M, and C_A is the consumption of A-goods. n is the number (technically speaking, the mass) of varieties i produced in the West, n^* is the one produced in the East. We choose units of the mobile factor H such that its whole amount in Germany equals 1. Assuming one mobile factor per each firm, the number (mass) of German firms is a numeraire as well $(n + n^* = 1)^3$. σ is the constant elasticity of substitution between M-varieties, μ is the share of expenditure for M-goods.

The indirect utility of a western owner of H is ω , the one of a worker is ω_L , with

$$(2) \quad \omega = w / p, \quad \omega_L = w_L / p.$$

Both expressions have their counterparts in the East. p is the price index (dependent on the prices for A-goods and M-goods) given by

$$(3) \quad p = p_A^{1-\mu} \left(\int_0^{n+n^*} p_i^{1-\sigma} di \right)^{\frac{\mu}{1-\sigma}}.$$

Because of the product heterogeneity, one can observe the usual trade-off between economies of scale and product diversity. Trade in A-goods is free (we assume that they are easy to obtain due to their homogeneity), but trade in M-goods is inhibited by iceberg trade costs. For selling one unit in the other part of Germany, a firm must send $\tau > 1$ units. $\tau - 1$ units of the goods melt on their way.

Not only the goods can be traded, but also the creative human capital is able to change its region. Following the assumption of equal regional size, the share of labour-force is given by $s_L = s_L^* = 0.5$ in both the West and the East. Assume L to be immobile and H to be mobile between East and West⁴. The whole amount of H is chosen as numeraire as well. However, the spatial allocation of H is endogenous. If the indirect utility of one unit creative human capital in one region is higher than in the other one, there is an incentive to move into this region.

³ See Baldwin et al. (2003) for the structure of the model and the choice of numeraires.

⁴ L can also be assumed to be mobile. Under this assumption there would be no immobile factor, which can cause a total agglomeration of all factors. Having no other persons in our model, this excludes the problem. Note that the agglomeration of H is just a problem for the immobile persons in the East. An additional partial emigration of L would make the problem even worse for the people who are still staying in the East.

Most of the contributions to the New Economic Geography consider the mobile factor to be perfectly mobile. In reality, you will not find this perfect mobility. But just this assumption is responsible for the corner-solutions of complete agglomeration in most of the models. These models may give a good idea of how the agglomeration process is running, but they are not suited to depict reality and to show how different tax rates will work. This is the reason why it is necessary to enrich the model with partial mobility of the H-factor. Our mobile creative human capital H is only changing its region when the utility-win outweighs the mobility costs.

The mobility costs f of H are described by the share of H in one region and the parameter λ (giving the home preferences):

$$(4) \quad f_H = \lambda(s_H - 0.5)^2, \quad \lambda > 0 \text{ for } s_H \geq 0.5 \quad \text{and} \quad f_H = -\lambda(s_H - 0.5)^2, \quad \lambda > 0 \text{ for } s_H \leq 0.5.$$

s_H is the share of creative human capital in the West. We grade the creative ones by their willingness to leave the country. Starting at $s_H = 0.5$, the first person who is changing region is someone who is almost indifferent in his decision to move or to stay. His mobility costs (or his home preferences) are negligible. But as more and more people go, more and more persons with stronger preferences for staying have to leave the region. The individual costs of migrating (or leaving the preferred home region) are growing (see the dashed line in the following figure 1).

A short- and a long-run equilibrium are to be distinguished. In describing the first one, we take the spatial allocation of H as exogenous. The price of A-goods is $p_A = w_L a_A = p_A^* = w_L a_A^*$ due to perfect competition in West and East and the non-existence of trade costs. Additionally we have to assume that there is no full specialisation of one region (both regions always produce A-goods; μ is sufficiently low)⁵. Germany-wide demand for A is given by $C_A = (1 - \mu)(E + E^*) / p_A$. E is the expenditure of the people in the West, E* the one of those in the East.

A constant share μ is spent on M-goods, so one can build a demand function for a variety of one M-goods**. Having assumed iceberg costs, for a monopolistic competitor mill-pricing is optimal, and the consumer prices for a western variety in the West and East are given by:

⁵ See Baldwin et al. (2003) for describing the NFS-condition.

$$(5) \quad p_M = \frac{w_L a_M}{1 - (1/\sigma)}, \quad p_M^* = \frac{\tau w_L a_M}{1 - (1/\sigma)}.$$

For a given s_H (in the short run) the reward of one unit creative human capital (its nominal wage) in the West (East*) (with mill-pricing and constant mark-ups) is

$$(6) \quad w = \frac{\mu}{\sigma} \frac{E^W}{n^W} \left(\frac{s_E}{s_H + \varphi(1 - s_H)} + \frac{\varphi(1 - s_E)}{\varphi s_H + 1 - s_H} \right); \quad w^* = \frac{\mu}{\sigma} \frac{E^W}{n^W} \left(\frac{\varphi s_E}{s_H + \varphi(1 - s_H)} + \frac{(1 - s_E)}{\varphi s_H + 1 - s_H} \right)$$

$E^W = E + E^*$ is the expenditure of the whole of Germany. The already known μ and σ give an idea of how much is spent on one variety of M. $n^W = n + n^*$ is the number (mass) of varieties of M-goods in the whole of Germany. More firms means more competition, thus making the reward of one firm (one H) smaller. The reward also depends on the share of expenditure in each region (s_E and $1 - s_E$), the share of the mobile factor H (also meaning the share of firms) (s_H and $1 - s_H$), and a variable φ . φ is a mnemonic for the “freeness” of trade, it is given by $\varphi = \tau^{1-\sigma}$ and $0 \leq \varphi \leq 1$. A rising φ means that trade is getting freer.

There is one other relationship between s_H and s_E (the „market size condition“). By moving one firm (or one unit of H) (changing s_H), the share of expenditure s_E changes as well:

$$(7) \quad s_E = 0.5 - 0.5 \frac{\mu}{\sigma} + \frac{\mu}{\sigma} \left(\frac{s_E}{s_H + \varphi(1 - s_H)} + \frac{\varphi(1 - s_E)}{\varphi s_H + 1 - s_H} \right) s_H$$

gives the influence from changing s_H .

This connection between s_H and s_E is one of the main differences in the New Economic Geography between the models with mobile people (the “so-called entrepreneur”) and the ones with mobile capital, where the profits of the mobile factor are repatriated (and the connection above does not exist). We want to observe the case of emigration from Eastern Germany, so we cannot take a footloose capital model with repatriated profits⁶. However, it is

⁶ See for example Martin/Rogers (1995).

politically unthinkable for Germany to accept that one region is significantly poorer than the other one. When looking at the German interregional redistribution, we have to add a further assumption to our model. We assume that the connection between s_H and s_E does exist, but that a share of expenditure $s_E^* < 0.4$ in the East will not be accepted and will be corrected by redistribution. We further assume that this redistribution does not influence the agglomeration process in any other way than via expenditure. This should be realistic due to the fact that a large percentage of the transfers are made inside the social security systems. It is not their purpose to influence the agglomeration process.

A few normalisations are already made. We are further allowed to assume $p_M = 1$ (thus following $p_M^* = \tau$), $p_A = p_A^* = w_L = w_L^* = 1$ and $E^W = 1$. Remember that $n + n^* = 1$, $n = H = s_H$, and $n^* = H^* = s_H^*$.^{7 8}

The indirect utilities in East and West are allowed to be different in the short run; nonetheless, there is a positive incentive for H to move if they are. This happens in the long run. Each mobile creative human capital owner is inclined to move into the region where his indirect utility is higher. Further assume that East and West are allowed to tax the wage-income of the creative human capital. The tax rate is t in the West (t^* in the East). An incentive to move exists if the indirect utilities are

$$(8) \quad \omega_t \neq \omega_t^* \quad \text{with} \quad \omega_t = (1-t)w/p \quad \text{and} \quad \omega_t^* = (1-t^*)w^*/p^*.$$

However, as long as the difference between the indirect utility in West and East is too small to compensate for mobility costs, the mobile factor does not move. Figure 1a shows the so-called wiggle curve - the quotient of indirect utilities (in this case for symmetrical taxation in both regions) $\Omega_t = \omega_t / \omega_t^*$ (like the current German situation) – for the agglomeration case, and it depicts the mobility costs as well.

There are three possible long-run equilibria; two of them are stable. There is a stable one with the larger share of H in the West (point W) and another stable one with the larger share in the

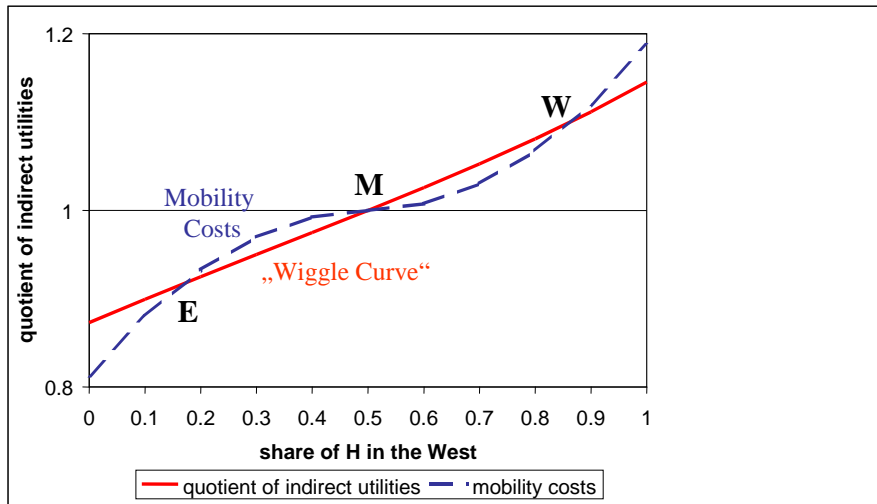
⁷ See Baldwin et al. (2003).

⁸ Note, that $\mu < \sigma - 1$. This is the co-called “no-black-hole” condition. It prevents agglomeration forces overpowering dispersion forces already at the very beginning of economic integration getting a negative break point.

East (point E). Common to both of them is that there is an incentive for the remaining mobile factors to move to the core as well, but these migrations are prevented by mobility costs. The third equilibrium is the symmetric solution point M (in the middle), where the indirect utility is the same in East and West. In the case of agglomeration when the slope of the wiggle curve is positive in M, the middle equilibrium is an unstable one, because the movement of any person is bound to start the agglomeration process. Having assumed symmetric regions, this third equilibrium is at $s_H = 0.5$. Stronger home preferences would make the curve of mobility costs f_H steeper and cause the equilibria W and E to shift towards the middle M. Agglomeration of H will decrease under these circumstances.

figure 1a

Illustration of the agglomeration case (case a: $\mu = 0.5$, $\sigma = 2.5$, $\varphi = 0.5$, $\lambda = 0.75$)

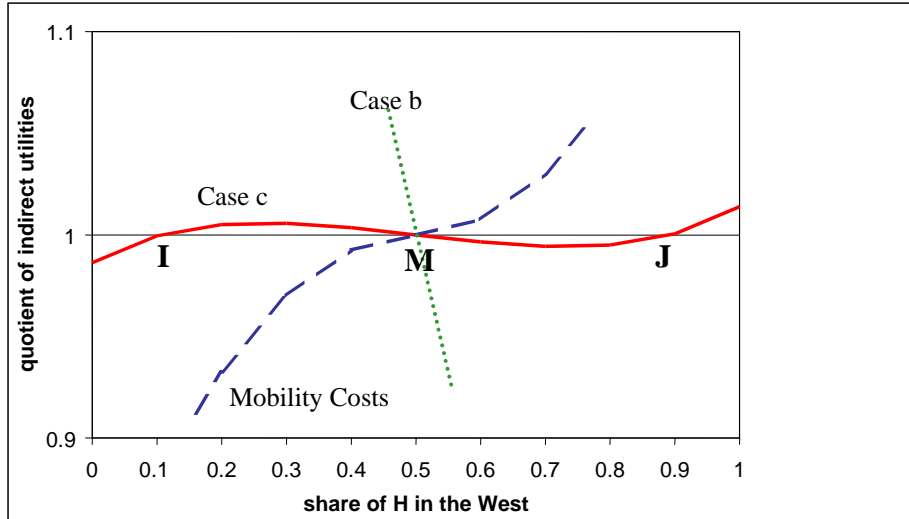


The wiggle curve is dependent on the freeness of trade φ . High trade barriers (or a low φ) are responsible for a negative slope of the wiggle curve at point M (as it is also produced by the standard tax competition models) (see the dashed line in figure 1, case b with $\varphi = 0.1$). Freer trade (allowing for agglomeration) makes the graph look different again. At the so called “sustain point” of φ (which could be depicted only by plotting against φ) the wiggle curve changes its direction, from this φ onwards now increasing. For a certain range of φ the wiggle curve shows a minimum on the right side of M and a maximum on the left side. Agglomeration forces produce a positive slope at I and J (figure 1b; case c with $\varphi = 0.32$). Nonetheless, M is stable and the only equilibrium (considering mobility costs). However, a

further increase of φ makes the extreme values vanish and leads to the agglomeration case of figure 1a with E and W as the only stable solutions⁹.

figure 1b

The dispersion cases (case b : $\varphi = 0.1$ and case c : $\varphi = 0.32$)



The agglomeration process in the model is based on three different effects. The home-market effect enables firms to find more customers in the more crowded region. When persons are moving to the West, more potential customers will be accumulating. The share of expenditure in the West will be growing. This will boost the returns to H by increasing w . The rising number of firms in the West will be making products more heterogeneous and thus raising the living standard in the West. A growing share of M-products must be imported into the East which causes transport costs, making life relatively more expensive. This effect is called the cost-of-living effect. These are the two reasons for the migration of the creative human capital. The migration is self-reinforcing, circular causation comes into play¹⁰. In contrast to these effects there is only the local competition effect acting as a diversity force. The competition in the West will increase relative to the East. From an intermediate φ onwards, the first two effects will be much stronger than the last one and are able to cause considerable (and in the original Krugman world even total) agglomeration.

⁹ See Appendix A for a simulation of the parameters and the changes in outcome. Appendix B is a small extract of the table presented in Appendix A that is detailed enough to display the rather rare case c of figure 1b as well.

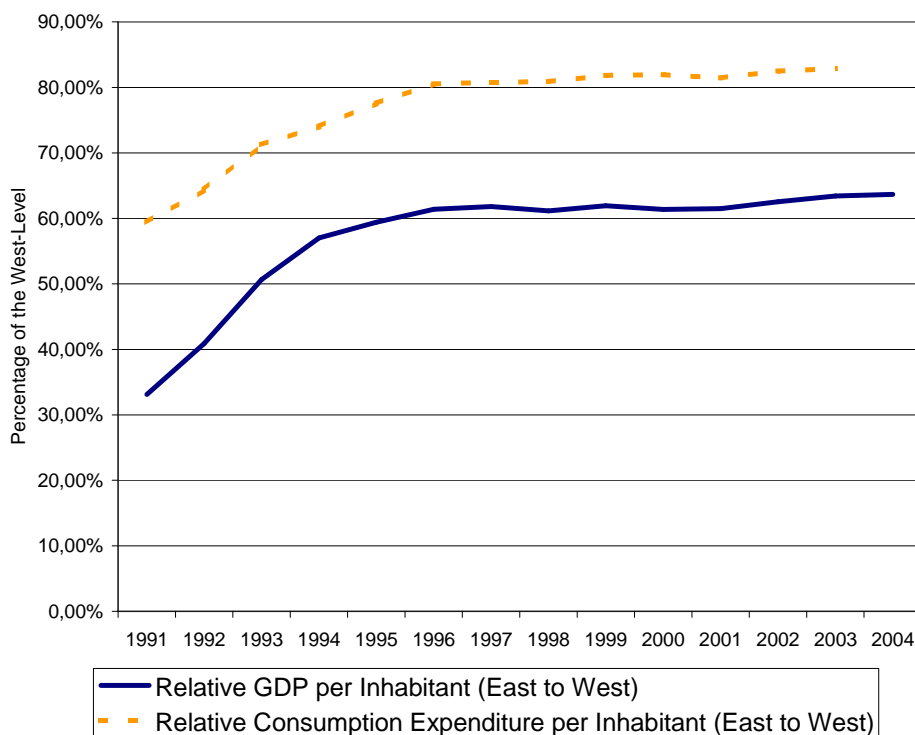
¹⁰ In the model, the prices in the West will be lower than in the East, because the model disregards all kinds of local homogeneous non-tradable goods. The scarcity of these goods defeats the cost-of-living effect in reality. But it can be observed that many people prefer to live in the West, believing there is a better living standard despite higher prices for homogeneous non-tradable goods there. Thus, one can be confident that, nonetheless, the cost-of-living effect is working.

III. The Case of Germany

After reunification in 1990, Eastern Germany was suffering from a considerable lack of productive capital. Akerlof et al. (1991) provide a useful survey showing the problems and the political shortcomings in those years. Rising wages and the overvalued exchange rate of the East German Mark were the pitfalls which led to high unemployment in Eastern Germany. Probably as a result, the convergence process of Eastern Germany stalled, the relative GDP of the East is stagnating at around 2/3 of the Western German level since 1996 (figure 2). One can observe a sizeable productivity gap between West and East, and unemployment rates are twice as high as in Western Germany.

figure 2

GDP and Private Consumption per Inhabitant in Eastern Germany



Arbeitskreis VGR der Länder (2005)

Besides these problems of the productivity gap and of wages having been set above market clearing level – a fact that must not be underestimated in its consequences on Eastern Germany's productivity and income – there is another big problem to deal with. Mass emigration into the West can be observed for the early nineties following reunification. The

net-migration is rising again since 1996. Eastern Germany has lost more than 10% of its population to the West (Burda/Hunt, 2001; Statistisches Bundesamt, 2005). Although the ongoing migration can not be associated with a huge brain drain, the young and the higher educated have been found to be more inclined to migrate relative to their weight in the total population (Kempe, 1999, 2001; OECD, 2001, p.136). Low skilled and older people, on the other hand, tend to stay.

To this problem it must be added that, in general, East Germans believe in the responsibility of the state and favour state interventions more than West Germans do. Alesina/Fuchs-Schündeln (2005) observe a significant bias in preferences of West German inhabitants towards a market regime compared to the East Germans. They also present empirical evidence that younger people in Eastern Germany are less in favour of state intervention than older ones, and even the younger people who migrate to the West are less so than those who stay. The difference between West and East Germans is explained as a direct effect of the previous communist regime of the GDR.

Statistically, the qualifications of the labour force in Eastern Germany are higher than in West Germany (Davies/Hallet, 2001). But before reunification, the East German education system stressed basic knowledge and vocational, largely technical skills. Creativity, diversity and ideologically unsafe topics were suppressed (Laporte/Schweizer, 1994). The result was a lack of managerial and marketing skills. This might have hampered the competitiveness of East German products. The deficiency in special business skills in the East – especially the lack of managerial, marketing and organisational skills, some special kind of social human capital that determines successful entrepreneurs (we call it creative human capital) – is often blamed for the poor economic performance of firms in the East (OECD 2001; Burda/Hunt, 2001, p.63; Davies/Hallet, 2001). Without these skills, it is difficult to assess distribution channels and markets, to build a reputation and to establish brand names (Quehenberger, 2000). This is yielding less product heterogeneity and lower prices for comparable products in the East. Losing to the West just the young people with a positive attitude towards the market economy to the West will result in an additional problem for those staying in the East (Burda/Hunt, 2001).

There are several reasons for young people to emigrate. Uncertainty about the political future may have been a reason in 1990, but not today. On being asked, they put forward a higher

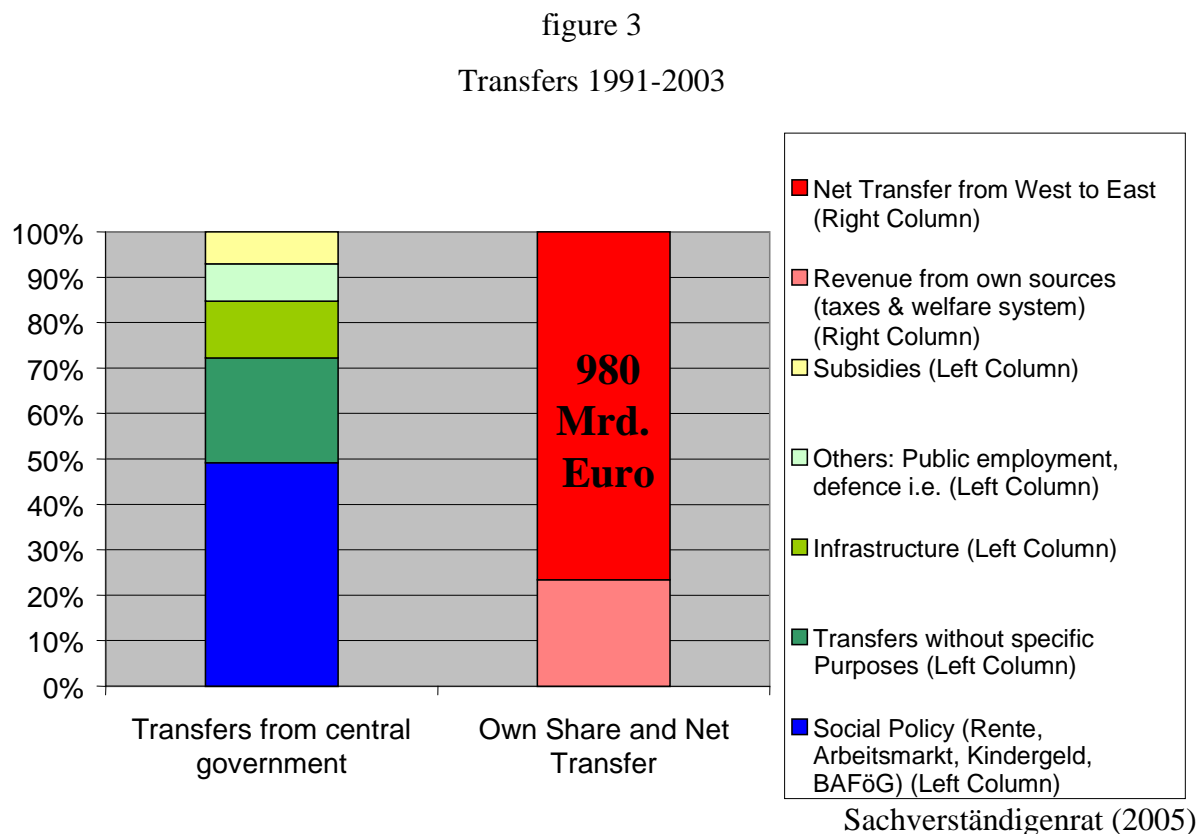
income (43%), less unemployment (36%) and a better living-standard in the West (39%; including a greater diversity in consumer goods for their leisure time)¹¹. Unemployment caused by wages above the market clearing level is surely a huge problem for the East, but it is not the aim here to focus on it¹². However, the other two reasons are important concerning the problem of mass emigration: Higher wages and a better living standard in the West. Both are exactly the consequences to be expected accompanying the agglomeration process of creative young people as in the model presented. This is indeed pointing to agglomeration forces at work. Note that a better living standard means better access to the different heterogeneous products that young people want to consume. In terms of an agglomeration model, this is to be interpreted as a lower price level for heterogeneous products in the West. The living standard in the West is supposed to be higher. This appears to be paradoxical because living in the East is said to be cheaper. Anyway, the cheaper heterogeneous products that are available in the West obviously compensate the migrating Easterners for the general higher prices of many homogeneous products in the agglomerated areas of Western Germany.

In an attempt to stem this pattern of migration, the German Government, the West German states and the EU have provided considerable amounts of transfers for the East, most of them via the social security system. About € 980 billions have been sent from West to East Germany between 1991 and 2003 (see figure 3). This is the reason for the difference between production and consumption level in the East that appeared in figure 2. Being linked to the development of the wage level, the transfer income (unemployment benefits and pensions) increased as well. Household incomes have converged much more rapidly than GDP (Figure 2). Today, public transfers account for nearly a third of the East German average income.

More than € 800 billions cumulative investment has been made in the East (including private investment) from 1991 until 1998 (most of it in structures). However, capital per capita in the East is still far lower than in the West. Moreover, the Eastern German equipment investment per capita has fallen significantly below the West value (Sinn/Westermann, 2001; Burda/Hunt, 2001). This indicates clearly that Germany's convergence in terms of capital endowment has come to a halt. There are surely many reasons (German wage structure, wage inflexibility, industry density in the East, the decline of the construction sector), but all of

¹¹ These figures have been identified by the Leipziger Institut für Marktforschung (2000) for the *Mitteldeutsche Zeitung*. Note that there was more than one answer possible. According to the same institute, in 2020 there will be only about 12 million people left living in the East, 2/3 of them already of retirement age.

them were by no means new reasons in 1996 (when convergence stopped) and thus cannot explain the abrupt and early end of the convergence process convincingly (Burda/Hunt, 2001).



After all, East German infrastructure endowment has shown strong growth and is now in some respects even better than the Western German one (DIW et al., 2003; Sachverständigenrat, 2005). The labour force is said to be well qualified (at least compared to the West). General human capital (measured in education) has good standards (Burda/Hunt, 2001; Davies/Hallet, 2001). The workforce is expensive compared to other countries, but it is still cheaper than in the West. Adding to this the huge amounts of transfers and subsidies, one must wonder why the problems are not diminishing. In a region with conditions so similar to the West German ones and still lower wages, a further convergence should be observed.

Taking this into account, the mass emigration of the young has to be seen not only as a result, but also as an important reason for the end of the convergence process. This emigration must be seen as the self-reinforcing inducement of the ongoing agglomeration process described in the model. The migration of creative human capital agglomerating in some West German regions is driven forward by pecuniary externalities. Larger Markets, higher wages and a

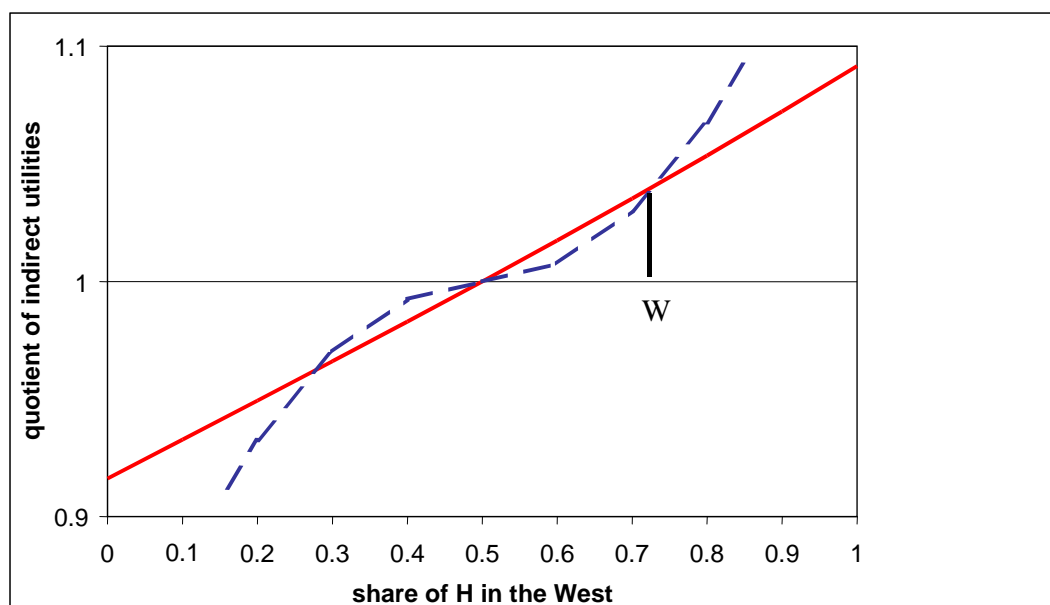
better living standard in the West attract the mobile people, and their agglomeration enlarges markets, raises wages and improves the living standard in the West.

Observing that young people are agglomerating in the West, an increasing wiggle curve has to be assumed for the German case. M is (due to the assumed symmetry) always a point of the wiggle curve. It is possible to yield the result that $s_H = 1$, hence, the relative indirect utility Ω_i is $\Omega_i > f_H$ (see appendix A). In this case, even the creative person with the highest preference for staying in the East will change region. All creative human capital would be leaving the East. No heterogeneous products will be produced there any longer. We cannot exclude this case because of the problems of measuring product heterogeneity. However, this scenario can be thought extremely unlikely already to have happened in Germany. Therefore, we assume a gently inclined wiggle curve and point W to describe the German case, being confident that the rising wiggle curve and the rising mobility costs are both close to what has happened to Germany.

As an Easterner, you can get all western products as well, at least if you pay the money to travel. But quality of life is better in the West, and it is still very expensive to draw all that quality into an Eastern home. On the other side, Germany is one country (without trade barriers), and transportation costs are continuously falling. So the “freeness” should be rather high, φ is assumed as $\varphi = \frac{2}{3}$. The expenditure share μ on M -goods is not low considering all the brand names (as a proxy for heterogeneous products) in Germany. But people are spending on (homogeneous) no-name-products as well. It depends on the definition of M -goods and A -goods to estimate μ . It is assumed here as $\mu = 0.5$, λ is assumed to be 1.

The elasticity of substitution σ between different varieties of M is the last missing parameter. Choosing $\mu = 0.5$ and $\varphi = 2/3$, any $\sigma < 5$ will lead to partial agglomeration. The case is illustrated with $\sigma = 3$ (figure 4). Of course, it must be admitted that this simulation is just at the beginning and far from using it to make any numerical deductions. But it is already sufficient to outline the general problem of the German case and to provide a basic pattern for discussing possible helpful activities of Eastern Germany.

figure 4
The German Case



Not only the migration of people, but also the movement of capital can create agglomerative forces even if the profits are repatriated. There will be no self-reinforcing effects if capital owners stay at home. But supposing more expenditure (because of more inhabitants) in one region, one can show that for an intermediate value of φ mobile capital per capita will be distributed unevenly across the nation (Martin/Rodgers, 1995). The reason is the market-access effect. It must be assumed that in case of an agglomeration of consumers (via the agglomeration of creative human capital) in the West capital is bound to agglomerate there as well. It seems to be straightforward to suggest that the lack of capital in Eastern Germany could partly be explained in this way, but we cannot provide more evidence.

Another force to make the agglomeration effects even stronger is based on the so-called “race to the bottom” theory. Having the same tax rate for each kind of factor income in each region, this theory draws the conclusion that people will be spread evenly across the nation. But considering agglomeration effects, it is to observe that there is a growing share of consumers in the West. The West can produce more local public goods than the East, because the tax revenue in the West is higher. This is a further incentive for Eastern people to migrate – even for the (in the model immobile) workforce and not only for the creative human capital. Harmonised tax rates can start a “race to the bottom” and even aggravate the problem.

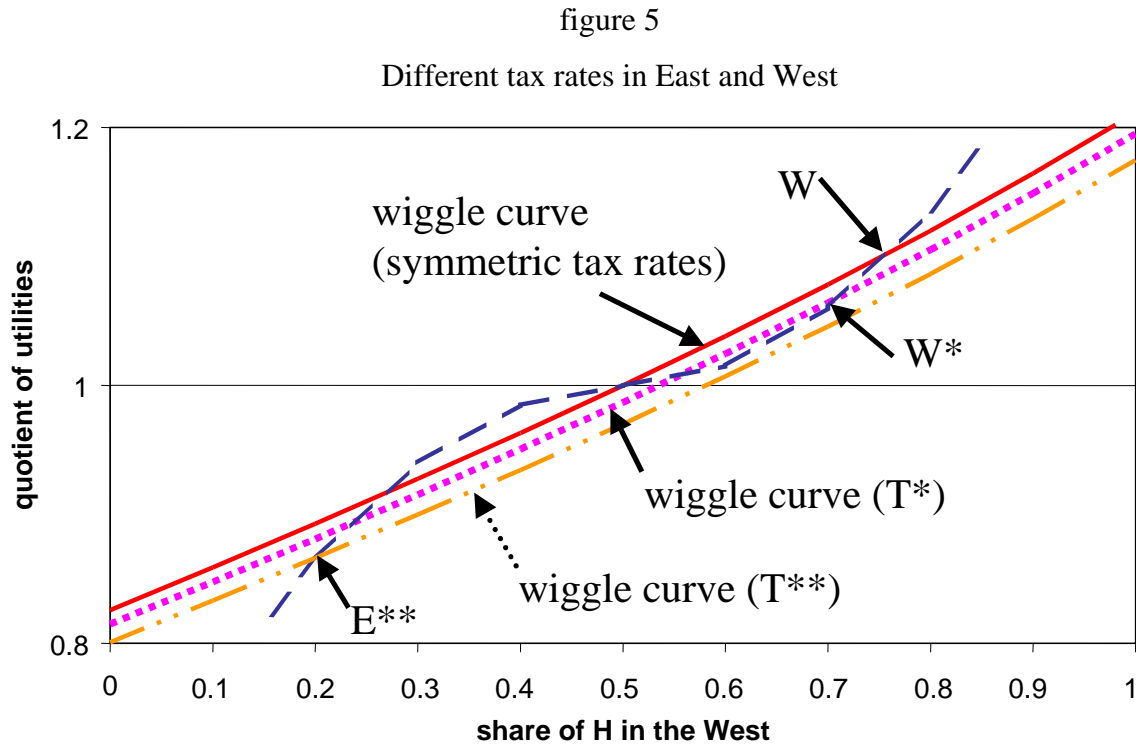
IV. How can the East get help to help itself?

The central question is whether and how the East could help itself. Bear in mind that any help for the East will not lead to a pareto-improvement for Germany as a whole. We have not discussed any possible market failure, and taking into account the efficiency gains resulting from free individual choices of the location, we do not believe it to be of a significant impact. So any measure to help the East is considered only from the viewpoint of Eastern Germany.

Only few policy recommendations can be justified on the grounds of the New Economic Geography. Investments in the infrastructure in order to connect regions is one of them, working by lowering φ . In the long run, this is a very promising recommendation, but at first it is not unlikely to force further agglomeration. In fact, a better access to the West could raise mobility and empty the East even faster (Martin, 1999). More investments in intraregional infrastructure or raising subsidies in the East will work as well. However, they have to be financed by a central government. Another suggestion is about spending in the education of the Eastern workforce. Here we face the same budget problem: Additional tax revenues were necessary to finance this. And the well-taught creative human capital can be expected to leave the East immediately after its education. As we have not discussed any market failure, we cannot give an advice on this idea. Setting up beacons by favouring local industry clusters with subsidies are another often suggested alternative of helping the East, but they are also not the issue here, because there are no technological externalities assumed and discussed.

The East has to do more for the people prone to leaving. But for this, the Eastern German states should be allowed to use every political instrument that may help themselves. Tax rate setting is one of the most important ones. The East must be permitted to impose lower tax rates on the persons whose emigration is the direct reason of the East's problems, hence on the creative human capital. The ones, who are otherwise leaving the East, have to be retained by lower tax rates, or Germany will get the results of a "race to the bottom". Reducing the tax rate in the East slightly (the dotted line in figure 5 with the tax difference T^*) can already shift W to W^* while attracting some H . A few entrepreneurs will move back home, despite having strong agglomeration forces. This will lower Ω_i for all entrepreneurs in the West. The first important result thus is that even a marginal tax difference between East and West can already

help the East¹³. As one can see, the share of creative human capital in the East s_H^* will rise (s_H will fall) with each marginal tax rate decline there. Graphically, this is caused by shifting the wiggle curve downwards. Ω_t diminishes due to the different tax rates.



The “break point” tax rate for the East to get the core cannot really be expressed in numbers, because we are not able to give even a rough estimate of the underlying parameters. Working with $\varphi = 0.6$, $\mu = 0.4$, $\sigma = 3$ and $\lambda = 0.5$, you can observe a share of more than 0.7 in the West – a significant agglomeration (point W). But a tax rate difference of just one percent point (T^{**}) is already enough to change the picture completely for the East to attract the core. Under these circumstances, the simulation depicts the nearly catastrophic outcome feared by many Western Germans¹⁴.

The new wiggle curve (the chain dotted line) is located below the home preference curve (the dotted curve), thus leading to an immediate run home. Because of the tax difference, this run does not stop at $s_H = 0.5$, but at a partial agglomeration of H in the East (Point E^{**}). This is

¹³ This result is a new one: Ludema/Wooton (2000) and Baldwin/Krugman (2004) also examine, how tax competition works under agglomeration forces. But their agglomeration forces can create catastrophic results only. In this case, marginal reforms are not helping. Bork/Pflüger (2004) analyse this case, too. But unrealistically, they show it with identical agglomeration rents in East and West.

¹⁴ See for other parameters again appendix A. Tax rates that would change the direction of agglomeration are given as well.

a result similar to Baldwin/Krugman (2004) who, however, would obtain a complete agglomeration in the East. They put forward tax competition while setting a tax floor. Indeed, a tax floor could be a good idea to prevent the West from becoming the new periphery as a result of the tax competition. Our main conclusion is that in the case of partial agglomeration because of home preferences (as given in the case of Germany) any tax rate difference with a lower tax rate in the East does help the East to attract the mobile factor that the Eastern states urgently need. But on the other hand, this is risky: If the difference of tax rates is too large, a self-reinforcing agglomeration process can be created, directing all the mobile creative human capital into the East.

The most important results of the German Case are as follows:

- Firstly, there will be a core and there will be a periphery. It is not possible (or much too costly) to prevent that from happening. $s_H = 0.5$ will never be a stable equilibrium, if agglomeration forces are at work. Politics have to take that into account. Either the East or the West will be poorer.
- Taking all measures to make the East better off, this can end up with the core in the East. European help for Ireland is a good example that this is not only a hypothetical idea. If the complete convergence of the poorer region can be achieved, it is very likely to get a new core there.
- When never getting the dispersed outcome, policy measures should try at best to prevent (if they should at all), that the East will be empty in 30 years.
- Lastly, and this is not a surprise: Lowering marginal tax rates in the East will succeed, however, at the beginning the improvement is only marginal. Most authors of the New Economic Geography would deny that improvement, but under mobility constraints it is likely to get this result.
- It is not possible to reverse the agglomeration process making marginal reforms only. Assuming that the next generation is more willing to emigrate than the current one, this will drive the agglomeration process further. Marginal Reforms are not sufficient to stop it.

V. Policy Implications

The first advice to any politician who is thinking about how to help the East is that he has to accept the core/periphery pattern. If the central German government wants to affect it, it has to spend huge amounts of transfers and subsidies – year by year (as long as $\varphi < 1$). To attract more industry, the East needs a few specific factors that are agglomerated in the West (entrepreneurship, market behaviour, marketing skills). Hence, it has to attract the right people – or, it must at least retain its own creative human capital.

The same tax rate for creative human capital in East and West is too high for the East to compete. If the East imposed a somewhat lower tax rate, there would be a competition effect on the West. Lowering the tax rate only marginally, this competition may not be very sensible. The core will be staying in the West. But larger differences in tax rates can cause the core to change. To make sure there will be no complete shift to the East (this seems unfair as long as the West is co-financing this), it is possible to set a tax floor. The purpose of tax competition in this case is not to gain more efficiency, but to avoid too much and politically not accepted agglomeration in the East. Nevertheless, more efficiency is to be expected from competition as well.

To match the living standard of the West the East needs further help. The East will be remaining the periphery, and without the transfers Eastern Germans cannot win in a tax competition. Lowering the transfers will make the wiggle curve steeper yet, what can drive the agglomeration process further and leave behind a poorer and emptier East. The advice to lower taxes is not bound to bring an efficiency gain for Germany as a whole, it is only to help the East. One important objection that can be raised is that the East is poorer even when obtaining transfers. Hence, it is highly unlikely that the East is able to lower its tax rates. This objection is not wrong. However, the East does obviously not need to lower all its tax rates. The income tax rate for creative human capital is the one to be reduced. As an example, the Eastern German Länder could be allowed to impose their own age-dependent income tax rates. Thereby, it is not necessary to reduce all the tax rates in the East. Maybe a reduction of only a few percentage points of the income tax rates for young people with an income above the average will already be enough. The increasing market size in the East will soon be attracting more creative human capital, more young people and – via the market access effect – more consumers and more physical capital as well.

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[illegible]

neg dispersive	negative slope of the wiggle curve at M	M is stable (no agglomeration);
$s > 0,5$	positive slope of the wiggle curve at M	share of creative human capital is slightly larger than 0.5, but smaller than 0.6
$s > 0,6$	positive slope of the wiggle curve at M	share of creative human capital is slightly larger than 0.6, but smaller than 0.7
$s = 1$	positive slope of the wiggle curve at M	complete agglomeration in the West
$t > 0,01$	Any difference of more than one percentage point would be sufficient to change the direction of agglomeration. Remind, that as long as the East shows agglomeration advantages and tax rate advantages, the agglomeration in the East is higher than the previous one in the West (due to the additional tax rate advantage)	
For the reason of simplification, the values margin of s (share of creative human capital) is $s \in (0,5; 0,6; 0,7; 0,8; 0,9; 1)$		
and the values margin of t is $t \in (0,01; 0,02; 0,03; 0,05; 0,1; 0,2; 0,5)$		

Appendix B

		σ	μ	2	2	2	2	2	2
				0.2	0.3	0.32	0.34	0.4	0.6
		φ							
$\lambda=0.5$	0.2	neg dispersive	neg dispersive	neg dispersive	neg dispersive	neg dispersive	neg dispersive	neg dispersive	$s=1$
	0.3	neg dispersive	neg dispersive	neg dispersive	neg dispersive	neg dispersive	neg dispersive	$s>0.5$	$s=1$
	0.33	neg dispersive	neg dispersive	neg dispersive	neg dispersive	case c	case c	$s>0.8$	$s=1$
	0.35	neg dispersive	neg dispersive	neg dispersive	neg dispersive	case c	case c	$s>0.9$	$s=1$
	0.4	neg dispersive	neg dispersive	$s>0.5$	$s>0.6$	$s>0.7$	$s>0.7$	$s=1$	$s=1$
	0.6	$s>0.5$	$s>0.9$	$s>0.9$	$s>0.9$	$s=1$	$s=1$	$s=1$	$s=1$
	0.8	$s>0.6$	$s>0.8$	$s>0.8$	$s>0.8$	$s>0.8$	$s>0.8$	$s>0.9$	$s=1$
	0.9	$s>0.6$	$s>0.6$	$s>0.6$	$s>0.6$	$s>0.6$	$s>0.6$	$s>0.7$	$s>0.8$

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