



**Transfers, non-tradable goods and a
distorted economy in eastern Germany.**

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Transfers, non-tradable goods and a distorted economy in eastern Germany

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Abstract

A neoclassical 2x2 model with one tradable and one non-tradable good is used to examine some effects of the public transfers to eastern Germany. Results indicate that transfers enlarge the non-tradable sector at the expense of the tradable sector. In the case of minimum-wage-induced unemployment, transfers have a similar localisation effect.

Using data from social security employment statistics, the localisation effect can clearly be shown. The paper concludes with some speculation on the effects of transfers on growth prospects and hypothesises whether the transfer itself might be one cause for the low growth rates of the eastern German economy.

Keywords: transfer, non-tradable goods, eastern Germany

JEL-classification: F11, P24, R11

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Introduction

With the reunification a massive and permanent flow of public transfers to eastern Germany commenced. 13 years after reunification, total net public transfers still account for 26% of eastern Germany's GDP. The transfers are filling the gap between domestic consumption and production. Ragnitz (2005) estimates that between 63% und 73% of the transfers end up increasing private consumption.

The implications of an international unilateral transfer has always concerned economists, not only since the famous Keynes-Ohlin controversy on the reparation burden imposed on Germany after WW I. One question has always been whether a transfer can be immiserizing either by deteriorating the terms of trade or by creating a balance-of-payment disequilibrium to the disbenefit of the receiving country. At the risk of oversimplifying, this controversy has been solved. An immiserizing transfer cannot occur in the absence of any distortion such as increasing returns to scale, tariffs, rent seeking, existence of a third country and in a framework of a two good, two factors Walrasian-stable world. Much less attention has been paid to the question of what else a unilateral transfer may affect, especially in the "regional" context of a unitary currency regime such as that between eastern and western Germany or within the EURO-Zone. The purpose of this paper is to demonstrate the impact of a unilateral "social" transfer – i.e. a transfer to private households - on the economic structure of the receiving country.

Full employment Model

Consider a country or a region embedded in a unitary currency regime, such as eastern Germany relative to western Germany or the EURO-Zone. The country uses given amounts of labour ($L = L_A + L_B$) and capital ($K = K_A + K_B$) to produce, under perfect competition, two "composite" goods: an internationally tradable good (A) and a non-tradable local good (B).

Production functions are assumed to be linear homogeneous. The capital intensity is assumed to be higher in the tradable than in the non-tradable sector, $k_A > k_B$, and no factor intensity reversal may occur. Factors are compensated for by their marginal productivity, with w denoting the wage rate and r the endogenous interest rate. While the local good must be produced and consumed locally, the international tradable good may in principle be exported or imported at a fixed international price normalized to $p_A = 1$ as long as the domestic household receives enough wage and capital income to pay for it. As it is assumed that a trade balance is always attained, supply and demand of both goods must, in fact, be balanced locally, that is before a unilateral transfer is introduced. This setting allows us to use the simple 2x2 neoclassical model of a closed economy as described so vividly by Gandolfo (1986, pp I.63).

Although the model is well known, some results will be reproduced here for the reader's convenience. Using the envelope theorem, the supply side can be condensed to a system of functions of the price ratio $p = p_B / p_A$. An increase in the price ratio triggers a complementary change in the remaining eight variables, $A, B, L_A, L_B, k_A, k_B, r, w$. Directions are as follows: $\frac{dk_B}{dp} > 0, \frac{dk_A}{dp} > 0, \frac{dL_A}{dp} < 0, \frac{dL_B}{dp} > 0, \frac{dA}{dp} < 0, \frac{dB}{dp} > 0, \frac{dr}{dp} < 0, \frac{dw}{dp} > 0$.

Thus an increase in the price ratio p leads to an expansion of the non-tradable sector. As factors are fully employed, this expansion is at the expense of the tradable sector. The domestic product, valued at the price of the numeraire, is defined as $Y = A + pB$. The derivative with respect to p equals, due to Eulers Theorem, the production of the non-tradable good, $\frac{dY}{dp} = B > 0$. Rivera-Batiz (1982) has already shown these results by using duality theory.

Now, to show the localisation effect of a unilateral transfer, it is sufficient to show that the price ratio increases due to the transfer. As the direct beneficiaries of the social transfer are the private households, the demand side has to be introduced. Again, to a wide extent, the standard assumptions are employed.

The demand side is introduced via a representative household that spends its total income on both goods, thus $I = wL + rK = A^D + pB^D$ and the domestic product (Y) equals household income (I). The two notations are introduced since a transfer breaks up the identity in the following section. The second equality sign describes the budget constraint, and A^D and B^D describe the aggregate demand for the tradable and the non-tradable good, respectively. All markets are cleared in an equilibrium. The normal price effects, $\frac{\partial B^D}{\partial p} < 0$ and $\frac{\partial A^D}{\partial p} > 0$ ¹, as well as the normal partial income effects, $\frac{\partial B^D}{\partial I} > 0$ and $\frac{\partial A^D}{\partial I} > 0$, are assumed. The total differential of demand for the tradable good A with respect to p is positive, while for B it is not clear as the price and income effects point in different directions:

$$(1) \quad \frac{dB^D}{dp} = \underbrace{\frac{\partial B^D}{\partial p}}_{<0} + \underbrace{\frac{\partial B^D}{\partial I}}_{>0} \underbrace{\frac{dI}{dp}}_{>0} .$$

To ensure clear cut results, it is over-sufficient to assume that the local good B is not absolutely inferior, that is: $\frac{\partial B^D}{\partial I / p_B} > 0$. If income increases more than the price, demand increases. As

$$(2) \quad \frac{d \frac{1}{p}}{dp} = -\frac{A}{p^2} < 0 ,$$

¹ Positive as $p = p_B / p_A$

the sign of the total differential of demand for the non-tradable good B can now be determined:

$$(3) \quad \frac{dB^D}{dp} = \frac{\partial B^D}{\partial I / p_B} \underbrace{\frac{dI / p}{dp}}_{<0} < 0$$

as long as I and Y are equal or at least their total differential is in p . The market for the local good is thus classical: with increasing p , supply increases while demand decreases. The basic model is now complete. It is assumed that the equilibrium is unique and stable.

Unilateral Social Transfer

Now, the country or, more precisely, the households in the country receive an unconditional “social” transfer T from abroad, for example motivated by a political urge to increase their living standard. Households’ income is now equal to $I = Y + T$. The transfer is assumed to be too small relative to the domestic product of the transferee to alter the price of the international tradable good; p_A remains normalized to 1. The production possibility frontier of the small country does not alter either and all supply side reasoning of the previous section is still valid. What does change in the first place is the demand side of the model. By definition of a non-tradable good, local demand must still be met by local production, and the equilibrium market clearing condition ($B = B^D$) remains unchanged but will reach another value. The equilibrium market clearing condition for the tradable good changes to $A^D = A + T$ and domestic demand for the tradable good always exceeds domestic production. The gap is closed by imports in exchange for the transfer. With the price of the tradable good normalised to 1, the transfer equals the imported amount of the tradable good. Total differentiation of household income with respect to the transfer T shows that the income change goes beyond the transfer itself,

$$(4) \quad \frac{dI^T}{dT} = \frac{dp}{dT} B + 1$$

as the transfer has also a price effect on income.

To determine the sign of $\frac{dp}{dT}$, we use the fact that $B = B^D$ has to be valid in every

equilibrium and thus $\frac{dB^D}{dT} = \frac{dB}{dT}$ must be true in a changeover from one equilibrium to

another.

Total differentiation of the demand function for the non-tradable good with respect to the transfer yields

$$(5) \quad \frac{dB^D}{dT} = \frac{\partial B^D}{\partial 1/p} \frac{d1/p}{dT},$$

or using equations (2) and (4)

$$(6) \quad \frac{dB^D}{dT} = \frac{\partial B^D}{\partial 1/p} \left(\frac{1}{p} - \frac{A}{p^2} \frac{dp}{dT} \right).$$

As the transfer only alters the equilibrium production point on the unchanged transformation curve,

$$(7) \quad \frac{dB}{dT} = \frac{dB}{dp} \frac{dp}{dT}$$

may be set equal. Equating equations (6) and (7) and solving for $\frac{dp}{dT}$ yields

$$(8) \quad \frac{dp}{dT} = \frac{\frac{\partial B^D}{\partial 1/p}}{\frac{dB}{dp} p + \frac{\partial B^D}{\partial 1/p} \frac{1}{p}} > 0,$$

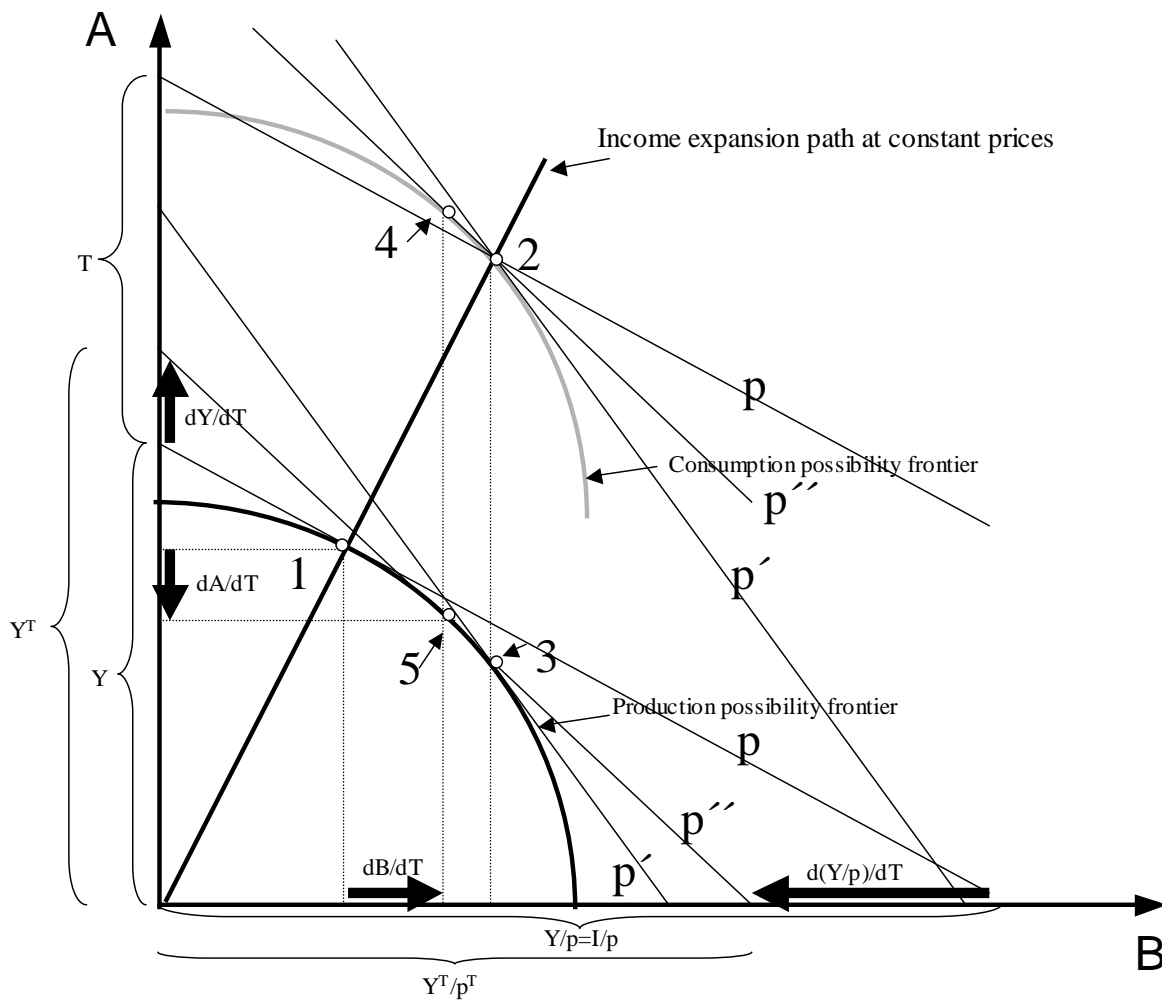
which is positive as all terms are positive.

Thus the price ratio increases due to a (marginal) transfer and all the former results of a rising price ratio remain valid. A unilateral unconditional transfer to domestic households triggers – in the case of full employment – the following effects:

- The domestic product, valued in terms of the tradable good, is increased by more than the transfer.
- The wage increases while the interest rate decreases. Income distribution is shifted to the benefit of labour.
- The demand for the local good, which is of the most interest here, is raised by the transfer. As demand must equal production, by definition of non-tradability, the economy localises in physical as well as in value terms (as the price ratio increases, too). Labour and capital are shifted to the non-tradable, local sector. Capital intensity in both industries is higher.

The effect of a transfer is illustrated in the following graph. The production possibility frontier intersects with a straight line from the origin. This line represents the income expansion path at constant prices and – for ease of the graphical treatment - homothetic preferences. The pre-transfer equilibrium is at the intersection, point 1. Now a transfer is introduced. Due to the transfer the consumption possibility curve differs from the production possibility curve, the consumption possibility curve being shifted parallel upwards. Keeping the price ratio constant for the moment, the households would consume at point 2. As the non-tradable good must be produced domestically, consumption point 2 would correspond to production point 3. But at point 3 the price of the non-tradable good is higher ($p' > p$), leading to a negative price effect on the demand side. Given the assumptions, the new equilibrium will be somewhere between point 1 and point 3, e.g. at point 4. The corresponding changes in the production of good A and B, as well as the increase in the domestic product (Y), are indicated with the bold arrows.

Graph 1: The Impact of a Transfer



The obvious discrepancy between this model and reality is the high unemployment in eastern Germany with rates of about 20%. Still, this full employment model may be oversimplifying the labour market if labour is not homogenous, as is assumed. The transfer effects on the economic structure will have some explanatory power if and only if shortages exist on some factor markets – e.g. for highly qualified, for “entrepreneurs”, for land.

Minimum Wage, unemployment and Transfer

The main question when considering unemployment is how to model it in a general equilibrium model. “Natural unemployment”, “efficiency wages”, “optimal contracts and asymmetric information” and other possibilities may all contribute to the generally high unemployment in eastern Germany but are unlikely to explain rates of 20%. Paqué (2000a,

p.13) suggests that the vicinity of western German labour markets with higher wages and negligible migration costs might force employers to pay above market clearing wages because workers may threaten to migrate westwards. This argument, however, requires some “efficiency wage” reasoning. The possibility we turn to is therefore that of a minimum wage, a choice supported by empirical research. Sinn (2000, p19) calculated that total hourly wage costs valued at tradable good prices have risen tenfold since the fall of the Berlin Wall in 1989. And the wages actually paid have even fallen short of the trade union wages in basically every year since the German reunification (Paqué, 2000b, p52 and Bundesbank, 1997, p25)². This negative wage drift supports the picture of a minimum wage inducing unemployment. Still, the transfer led to a wage increase in the full employment model, so one could argue that the administered increase in wage rates was at least backed by an increased labour productivity due to the transfer.

As the introduction of the minimum wage and of the transfer occurred simultaneously in eastern Germany, the partial effects of both have to be separated to show the pure transfer effect. First, the introduction of the minimum wage is analysed. Given an exogenous wage \bar{w} higher than the market clearing wage w^* obtained in the previous sections, the tradable sector, constrained by a fixed world-market price for its products, has to adjust by increasing its capital intensity to maintain profits at zero. Given a decreasing marginal physical productivity of capital, the interest rate drops. The non-tradable sector has a second option. By increasing the price for the non-tradable good, the higher production costs are passed on to consumers, but given a lower price for capital, capital intensity in the local sector increases too.

² The German Bundesbank attributes the positive wage drift primarily to the dramatic decline in the number of short-time workers from 1991 to 1992. (Bundesbank 1997, p 26).

To derive the shape of the transformation curve, observe that labour and capital are still paid according to their marginal productivity. Thus the profit-maximising optimality conditions $\bar{w} = f_A - k_A f_A' = p(f_B - k_B f_B')$, derived from partial differentiation of the production functions, remain valid but change their nature. Instead of being equilibrium conditions, they now have a clear causality. All elements of the right hand side of $\bar{w} = f_A - k_A f_A'$ are functions of the capital intensity alone, and so in principle the equation could be solved for capital intensity. Thus $k_A(\bar{w})$ is a function of the minimum wage alone and therefore does not vary along the production possibility curve. The marginal productivity of capital is also still defined by $r = f_A' = p f_B'$, the profit-maximising optimality condition. Again, as f_A' is a function of the capital intensity alone, the interest rate remains constant in spite of any variation along the production possibility line. By combining these arguments, it follows that the capital intensity in the non-tradable sector and the price ratio are constant too. Now, by using the condition of full capital employment, $k_A L_A + k_B L_B = K$, and replacing the labour demand terms with a transformation of the production functions, the production possibility frontier of the minimum wage economy emerges:

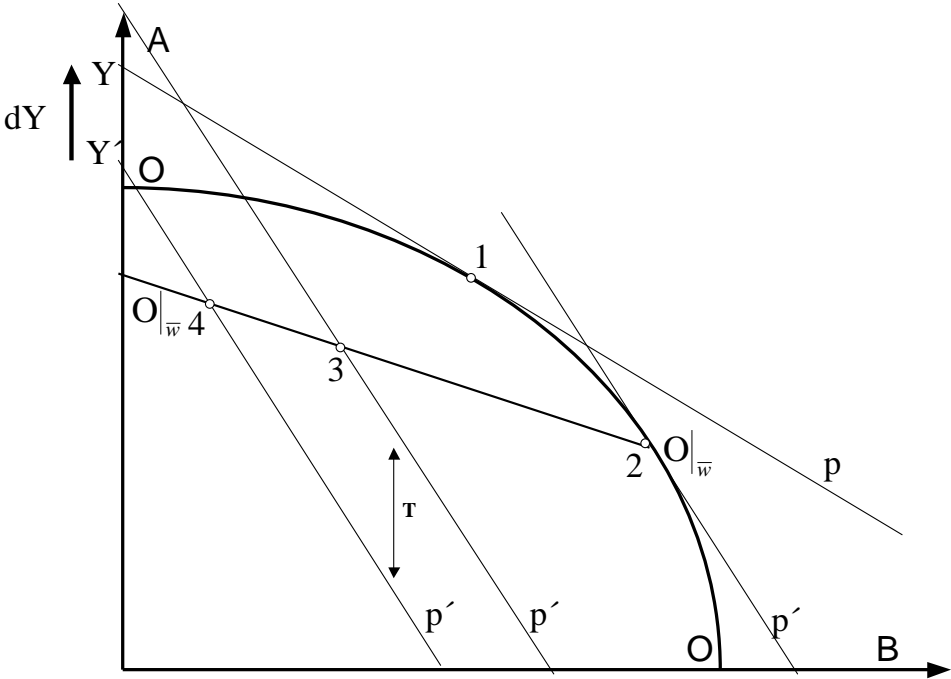
$$(9) \quad A(B) = K \frac{f_A}{k_A} - \frac{k_B}{f_B} \frac{f_A}{k_A} B.$$

Due to the constant capital intensities, the production possibility frontier is a straight line, where the first term is the y-intercept and $\frac{k_B}{f_B} \frac{f_A}{k_A}$ the line's slope.

In the following graph, the effects of introducing a minimum wage is shown graphically. Given the former full employment equilibrium, point 1, the minimum wage increases the price ratio p . Point 2, the point of tangency of this new – and, for the following, constant – price ratio with the former production possibility frontier gives the maximum production of B and thus the application range of equation 9. Given the assumptions made, it can be shown

that the new equilibrium is characterised by a lower production of both goods. As the capital stock of the economy is still fully employed and both capital intensities have risen, employment in both sectors decreases. The effect of the minimum wage on the domestic product valued at the price of the tradable good is ambiguous. It may be lower (as in point 4) or higher (as in point 3) than before the minimum wage was introduced (point 1). All the effects of the introduction of the minimum wage are summarized in Table 1 below.

Graph 2: Introduction of a minimum wage



Source: following Brecher (1974, p102)

Now, a transfer is introduced into this minimum wage economy. As the price ratio is constant along the production possibility line of the minimum wage economy, no demand-side price effect can occur. As both demand-side income effects are positive, the consumption of both goods increases. But again, the consumption of the non-tradable good must be met by domestic production. Thus the production of the non-tradable good increases at the expense of the tradable good. In the above graph, this is illustrated by a shift from point 4 to point 3. The shift is associated with a rising domestic product. Furthermore, unemployment is reduced

because the constant capital intensity in the tradable sector is higher than in the non-tradable sector. The tradable sector releases capital and associated labour in a constant proportion and the non-tradable sector employs that capital but combines it with more labour.

Analytical and Empirical Results

A transfer in a minimum wage economy alters significantly fewer variables than in a full employment economy (see Table 1). On comparison of the pure transfer effect in both models (Column 1 and 3), the value of no endogenous variable changes in opposite directions. At most, the full employment model predicts an increase or a decrease while no change is indicated in the minimum wage model. Keeping in mind that both models provide only a simplified representation of reality it is thus impossible to falsify or verify the validity of one of the two models using empirical research. In any case, it might be stretching things too far to demand that the models should exclude each other in reality.

What both models have in common is that a social transfer triggers growth in the domestic product valued at tradable good prices. But this growth effect comes at a price: the economy localises. The non-tradable sector is enlarged at the expense of the tradable and both factors of production migrate from the tradable to the non-tradable sector.

Before turning to empirical research to prove the localisation effect of a transfer in eastern Germany, the consequences of the simultaneous introduction of the minimum wage and the transfer has to be sorted out. If the predictions concerning their introduction point in the same direction, it is impossible to see the pure transfer effect. Fortunately, the value of one variable - employment in the non-tradable sector - changes in opposite directions. While the introduction of the minimum wage should decrease employment in the non-tradable sector, the transfer should lead to an increase. Thus, if empirical research provides proof of an increase, the localisation effect of a transfer in a minimum wage economy is shown. Bringing all arguments together, we summarise the predictions in column 4.

Table 1: Summary of the predicted development directions of endogenous variables

Impact	Flexible Wage Model	Minimum Wage Model		empirical research	
	Impact of transfer	Impact of minimum wage	Impact of transfer	Prediction	Empirically confirmed ?
Prices					
Price level of local goods	pos.	pos.	neutral	pos.	yes
Wage	pos.	pos. (by definition)	neutral	pos.	yes
Interest rate	neg.	neg.	neutral	neg.	not available
Resources					
Capital intensities	pos.	pos.	neutral	pos.	(yes)
Employment in local sector	pos.	neg.	pos.	pos.	yes
Employment in tradable sector	neg.	neg.	neg.	neg.	yes
Capital absorption in local sector	pos.	pos.	pos.	pos.	(yes)
Capital absorption in tradable sector	neg.	neg.	neg.	neg.	(no)
Ratio of capital absorption (local/trad.)	pos.	pos.	pos.	pos.	(yes)
Aggregates					
GDP valued at tradable good prices	pos.	?	pos.	pos.	yes
GDP per unit of capital stock	pos.	?	pos.	pos.	yes

The availability of reliable data to confirm the predictions of each model varies. Data quality on capital (capital stock, net investments, capital intensity, interest rate) is poor as no deinvestment statistics are collected in Germany. The figures published on the current value of capital stock are derived from cumulated gross investments and assumed depreciation rates. The assumptions underlying depreciation rates are derived from the “usual” useful economic life of investments. Therefore the closing down of the lion’s share of eastern German industry has not been taken into account. This might explain the positive development of the tradables’ sector capital stock. Data on employment and consumer prices are more reliable. By using data from the consumer price statistics, it is possible to show that the relative price of non-

tradable goods in eastern Germany has increased by roughly 10% compared to western Germany between 1991 and 1995 (Simons, 2006).

Employment by Sector

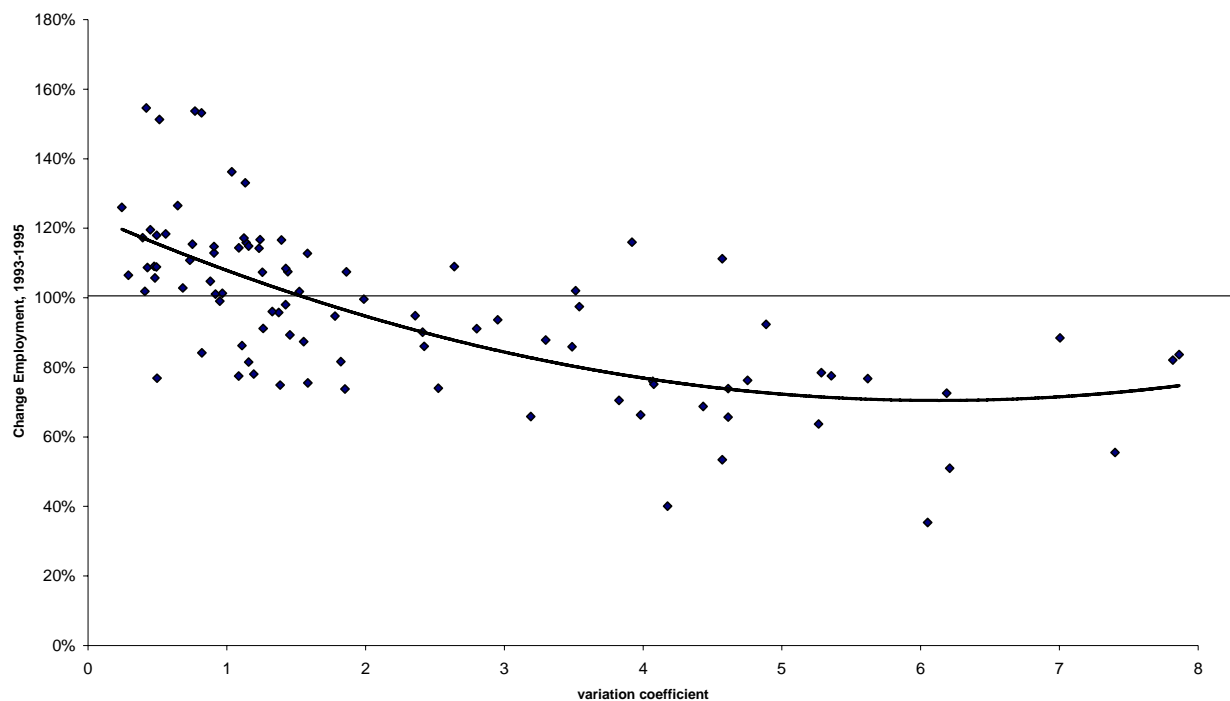
Both models predict that a transfer should lead to an increase in employment in the non-tradable sector. The main problem is to define the non-tradable sector. In the literature two main strands have developed. The first one classifies products and services themselves either ad hoc or according to some weight-perishability-fragile indices: see, for example, Naujoks (1993) or Dwyer and Groeger (1994). While Naujoks directly makes her point at the goods level - by proving empirically that the share of difficult-to-trade goods in total industrial production in eastern Germany has declined in the two years following reunification, Dwyer and Groeger trace private investment trends in Australia.

The second strand classifies sectors itself. In the most basic case, all industrial, and sometimes agricultural, sectors are considered ad hoc tradable while all services are non-tradable (see, for example, Dietrich et al, 1998, and Heitger, 1983). DeGregorio et al. (1994) have pointed out that with the development of traded services such as banking, this basic approach is no longer justifiable – albeit still often followed due to data availability - and define individual sectors as tradable if their export share exceeds 10% of total gross value added. Even though the basic idea seems very plausible, a rationale for the particular value of the dividing line – here 10% - is missing. Furthermore, the number of tradable sectors will heavily depend on the size of the country. Ewringmann (2003, p39) estimates that 60% of the total turnover of gas stations in Luxemburg is made with German customers. Thus gas stations would be a tradable sector in Luxemburg but surely not in the USA. With this argument, the German export statistics cannot be used in the regional context of eastern Germany.

The second strand will be developed further in the following. The main idea is to link the regional concentration of sectors to the tradability of their products. While the production of

non-tradable goods will – by definition of non-tradability – be more or less evenly distributed in space (that is in population density adjusted space), tradability of goods or services is a prerequisite for regional concentration. This idea originated from Krugman (1991), who pointed out that spatial Gini-Coefficients in the US vary enormously even within the industrial sector, which is often taken as a whole as a proxy for the tradable sector. Here the Statistic of Social Insured Employees was drawn on to analyse the regional concentration of all 95 sectors of the economy (68% of the total labour force). Not surprisingly, the eastern German variation coefficients were unstable in the first half of the 1990s. For this reason, the variation coefficient of employees per 1000 inhabitants among the 326 west German counties has been used as a proxy for tradability. Unfortunately for eastern Germany, this statistic is only available from mid-1993 onwards. Therefore, half of the transfer introduction phase is not covered. Nevertheless, results are clear cut (see the following graph). The estimation equation describes an increase in employment of 24% for evenly distributed sectors, i.e. pure non-tradable sectors, and a decrease of 30% for highly concentrated sectors within only two years.

Graph 3: Correlation between regional concentration and employment trends in eastern Germany, 1993-1995
 Employment in East Germany without Berlin



* "Unknown Sector" and "Representation of Foreign Countries" (26 Employees in 1993) excluded from calculations.

Estimation Function: $y = 0.0142x^2 - 0.1742x + 0.2388$

$R^2 = 0.4658$

Kendal-Tau-b Correlation Coefficient = -0.502, two-sided significant at the 0.01 level

F-Test significant at the 0.0000 level

T-Test: Constant significant at the 0.0000 level

T-Test: x significant at the 0.0000 level

T-Test: x^2 significant at the 0.0029 level

Source: own calculation using Statistic of Social Insured Employees

Conclusion and some thoughts on growth prospects in transfer economies

Using a neoclassical 2x2 model, this paper has shown that a unilateral social transfer will distort the structure of the economy of the receiving country or region. The non-tradable sector expands at the expense of the tradable sector while increasing the nominal domestic product valued at tradable good prices. This basic result remains even if unemployment prevails as long as a second scarce factor of production exists. Empirical support for the theory is strong for eastern Germany.

Having theoretically and empirically established the notion that the transfer has localised the economy in eastern Germany, it seems natural to discuss the consequences of such a distortion on growth prospects.

The first starting point may be the diminishing returns to capital in the full employment model. As the capital intensities in both sectors have been raised by the transfer, any increase in the capital stock yields a lower marginal return. Furthermore, as factors are paid according to their marginal productivity, the lower marginal productivity leads to a lower interest rate. However one might model causes for a capital stock enhancement (endogenous savings, FDI), a lower interest rate will correspond to slower capital accumulation and therefore lower GDP growth rate. Against these arguments for slow growth it might be argued that the reason for the lower interest rate in the transfer economy was the assumption of a given capital stock in the economy. Dispensing with this assumption would lead to a fixed world-market interest rate. A decrease in the marginal capital productivity – due to labour migration to the non-tradable sector – would then lead to a reduction of the regional capital stock to maintain the interest rate at the world-market level. Thus, the shrinking of the tradable sector due to the transfer introduction would be reinforced. With an endogenous capital stock, an increasing capital stock cannot be a source of growth per se. As in the minimum wage model, the interest rate does not change along the production possibility line and no negative growth effect can be justified with the interest rate.

The other starting point is the smaller tradable sector in the transfer economy – regardless of the labour market assumption. Then several causes for lower growth rates could be modelled:

- In line with the Balassa-Samuelson assumption that technological progress mainly occurs in the tradable sector, a smaller tradable sector would result in lower economy-wide growth rates.
- Grossmann and Helpman (1991) have pointed out that the diffusion speed of technical progress is higher in highly internationalised economies. Thus in more localised economies, the benefit of technical progress might spread at a slower pace.
- If research for technical progress contains some regional public goods elements, then a smaller tradable sector will produce less knowledge.
- If proximity is of any relevance due to internal or external economies of scale, as suggested by e.g. Marschall (Industrial Districts) or Krugman (New Geographical Economy), then a smaller tradable sector will produce less competitively. Even so, this cannot be shown when assuming linear homogenous production functions.
- If there is any further (complementary) scarce factor of production (entrepreneurial spirit, land, highly skilled labour) then the enlarged non-tradable sector will absorb more of it, very much analogous to the capital migration argument outlined above.

Summing up, there seems to be sufficient grounds to hypothesise whether the transfer itself might be one cause for the disappointingly low growth rates of the eastern German economy. Thus it might not be pure coincidence that the sharp downturn of growth rates in 1993/94 roughly coincides with the completion of the transfer introduction.

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