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# The rise or the fall of the wall? Determinants of low entrepreneurship in East Germany\*

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## Abstract

Between 1949 and 1989, communism restricted private entrepreneurship in East Germany, but even after reunification in 1990 entrepreneurship remained low compared to other transition economies. To quantify the determinants of low entrepreneurship in East Germany and its impact on economic outcomes, I set up a two-region model economy with occupational and migration choices. Individuals can become workers or entrepreneurs in East or West Germany. In line with German policy after reunification, in East Germany wages are fixed above labor productivity and there are capital subsidies. Managerial knowhow is a combination of innate talent and entrepreneurial parental background which only West Germans possess. Technological growth increases with the innate talent of entrepreneurs. Counter-factual experiments show that the missing tradition of entrepreneurship, while contributing to technological growth, accounts for almost 10 percentage points of the gap between East and West German GDP per capita. On the other hand, reunification (wage setting policy, migration possibilities, and subsidies) slowed down technological growth and increased the output gap by 7 percentage points.

*JEL classification:* F15, E24, J22

*Keywords:* Entrepreneurship, Growth, Allocation of Talent, Social Mobility, Transition

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# 1 Introduction

For the last two decades, economic growth in East Germany has been lower than in Poland, Hungary, and the Czech Republic.<sup>1</sup> In 2012, unemployment rates in East Germany were still almost twice as high and GDP per capita was around 76% compared to West Germany (Halle Institute for Economic Research [2014] and Bundesagentur für Arbeit [2008]). Between 2005 and 2019, 156 billion Euros of financial aid (Solidarpakt II) will flow to East German states. Policy makers often point to the lack of entrepreneurship as one of East Germany’s main problems: “The Organisation for Economic Co-operation and Development (OECD) and its Local Economic and Employment Development Programme has been working with the Federal Ministry of Transport, Building and Urban Affairs (BMVBS) since 2005 on an analytical and practical project on Strengthening entrepreneurship in East Germany as a critical lever for economic growth and employment creation” (OECD [2007a]). Between 1949 and 1989, while West Germany’s enterprise sector flourished, communism restricted private entrepreneurship in East Germany, and after reunification “[s]mall businessmen in east Germany fac[ed] a number of handicaps, mostly to do with being new to the game;” (Economist [1996]).

How decisive was the missing tradition of entrepreneurship for economic outcomes in East Germany? Faced with a strong entrepreneurship tradition in West Germany, would economic outcomes have been better in an independent East Germany? In order to address these questions – both qualitatively and quantitatively – I build a two-region model of occupational choice a la Lucas’ [1978]. Individuals differ in managerial knowhow which is a combination of innate talent and parental background in entrepreneurship, i.e. children of entrepreneurs observe how to run a business, inherit networks of clients and providers, etc. All East Germans as children of workers face a disadvantage. Given their managerial knowhow, individuals decide to be unemployed, to work, or to set up a business. They can also pay a moving cost and work or set up a business in the other part of Germany. While there are common capital and goods markets, labor markets of the two Germanies are locally separated. In line with German policy after reunification, wages in East Germany are fixed above labor productivity and as fractions of West German wages. The government pays important subsidies to the rental rate of capital to entrepreneurs in East Germany. Following Hassler and Rodríguez Mora [2000] low technological growth implies a slowly changing business environment, and past information about how to run a business is valuable. Children of entrepreneurs have more managerial knowhow and they – rather than the most talented individuals – set up businesses. Given that only

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<sup>1</sup>Accumulated growth rates for real GDP per capita for 2000 to 2013 for East Germany, Poland, Hungary, and the Czech Republic and Germany are 23%, 144%, 163%, and 77% and 37% respectively, see Figure A-1 of the Appendix A.

the innate talent of entrepreneurs matters for technological growth, individuals' occupational choices exert an externality. Given lower managerial knowhow and higher wages, more East Germans decide to work instead of setting up a business. The most talented East Germans set up businesses in West Germany, contributing to growth there. In East Germany, few mediocre entrepreneurs imply low growth. Too many workers and too few entrepreneurs together with fixed wages lead to involuntary unemployment in East Germany. Counter-factual experiments show that compared to the benchmark reunification scenario, the missing tradition of entrepreneurship led to 5% higher technological growth, but 34% fewer entrepreneurs in East Germany, accounting for 17% lower GDP per capita and 10 percentage points higher unemployment. On the other hand, had East Germany remained an independent country - without migration possibilities, wage setting policy, nor subsidies - growth and GDP per capita would have been higher (13%) and unemployment would have been 7 percentage points lower.

The current paper contributes to the literature by applying the theory on social mobility and economic growth as in Hassler and Rodríguez Mora [2000] to the context of economic transition. In 1990, after fifty years of living under communist rule, a generation of individuals did not possess any parental background in entrepreneurship. This raises the natural question of the implications for current entrepreneurship and economic outcomes. Germany is a particularly interesting case because entrepreneurship tradition had remained strong in the Western part.<sup>2</sup> To the best of my knowledge, the current paper is the first one to explicitly model the link between a missing entrepreneurship tradition and current economic outcomes in East Germany within a general equilibrium model.<sup>3</sup>

While parental background in entrepreneurship has a positive effect on becoming an entrepreneur, the resulting intergenerational occupational and social transmission is associated with low economic growth.<sup>4</sup> On the other hand, high rates of technological and economic growth reduce the value of knowhow passed on from past generations leading to higher intergenerational occupational and social mobility.<sup>5</sup> Both relationships: (1)

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<sup>2</sup>Conceptually this paper is also related to empirical studies that exploit the incidence of economic transition as a natural experiment to study entrepreneurship as e.g. Fuchs-Schündeln [2009] and Burcardi and Hassan [2013].

<sup>3</sup>Bajona and Locay [2009] consider the period before transition and establish a similar link between a reduced stock of managerial knowledge and low growth rates for planned economies.

<sup>4</sup>Pistrui et al [2000] find that 60% of West German entrepreneurs have a parent who had been an entrepreneur. Dunn and Holtz-Eakin [2000] find intergenerational linkage in self-employment to be stronger along non-financial lines than along financial lines. Arenius and Minniti [2005] find that simply knowing other entrepreneurs is positively and significantly related to being a nascent entrepreneur.

<sup>5</sup>Hassler and Rodríguez Mora [2000] bring forward various empirical evidence on the negative relationship between technological and economic growth and the value of parental background.

between parental background in entrepreneurship and economic growth and (2) between economic growth and social mobility arise in the model of this paper and have been treated by larger literature.<sup>6</sup> For instance, Caselli and Gennaioli [2012] show that missing markets result in the prevalence of dynastic firms and that managers being selected according to family ties rather than talent leads to lower total factor productivity. In Galor and Tsiddon [1997] parental background and growth are negatively related and as technology adoption evolves, parental background gains importance, wages become more equal, and technological progress slows down. The current paper is also related to the literature on cross-border flows of managerial talent, see e.g. Burnstein and Monge [2009], or Pica and Rodríguez Mora [2011].

There is a general consensus that the wage setting policy has been the main cause for East Germany's high unemployment rates; see Hunt [2008] for a review of this literature. In 1991, wages in East Germany were set to 50% of West German wages despite a lower ratio of East- to West German labor productivities. By 1995, East German wages had reached 70% of West German wages (Sinn [2002], and Fuchs-Schündeln and Izem [2012]).<sup>7</sup> Snower and Merkl [2006] argue that high unemployment rates in East Germany are a consequence of the wage setting policy together with generous welfare provisions. Canova and Ravn [2000] find that welfare provisions magnified the contraction of output and employment caused by differences in skill level and capital endowment. According to Burda and Hunt [2001] the policy of fixing relatively high East German wages had a dampening effect on East-West migration. In the model of the current paper, individuals expect wages above labor productivity to cause an excess supply of labor, and that with a certain probability they will be involuntarily unemployed. This positive probability causes expected wages to be lower and thus migration to be higher compared to a scenario with flexible wages. In the framework of a labor search model, Uhlig [2006] argues that low productivity and high out-migration rates are due to low levels of networking caused by a lack of established production. Similarly, the current paper considers how a lack of established production implies lower managerial knowhow and how this affects economic outcomes.

The remainder of this paper is organized as follows. The next section presents empirical

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<sup>6</sup>For a seminal paper on the topic see Murphy et al [1991].

<sup>7</sup>Presumably in order to restrict the number of East Germans migrating to West Germany, West German labor unions pressed for parity of wages (see e.g. Akerlof et al [1991], Sinn [2002]). Officially, labor unions demanded wage equity out of concern for East-West German equity and East German welfare. In addition, fixed wages impeded an offsetting of initial effects of the currency union between West and East Germany. Wages in Poland and the Czech Republic remained stable at around 10-20% relative to West German wages between 1990 and 1997 (Sinn [2002]).

evidence on entrepreneurship and migration in East Germany. Section 3 presents the model and Section 4 the calibration strategy. Then, Section 5 presents the results and counterfactual experiments. Section 6 concludes.

## 2 Entrepreneurship and Migration in East Germany

Between 1949 and 1989, private entrepreneurial activity was extremely restricted in East Germany, but also in other transition countries such as Czechoslovakia, Poland, and Hungary.<sup>8</sup> Today, there are significantly fewer enterprises in East Germany, see Table 2.1.<sup>9</sup> In particular, there are 15%, 75%, and 163% fewer firms compared to Poland, Hungary, and Czechoslovakia respectively. Numbers are similar when considering enterprises per labor force participants or employees, see Table A1 of the Appendix A.6.

Table 2.1: Enterprises per 1000 inhabitants

| Year | West Germany      | East Germany     | Czech    |        |         |
|------|-------------------|------------------|----------|--------|---------|
|      | (incl. firms with | zero employment) | Republic | Poland | Hungary |
| 2002 | 32                | 26               | 86       | 39     | 55      |
| 2003 | 33                | 26               | 86       | 38     | 55      |
| 2004 | 35                | 30               | 86       | 38     | 56      |
| 2005 | 35                | 30               | 84       | 37     | 55      |
| 2006 | 36                | 32               | 84       | 38     | 54      |
| 2007 | 37                | 32               | 86       | 39     | 56      |

Data: Eurostat [2005] (NACE: C-I;K), Statistisches Bundesamt [2008] (for Germany)

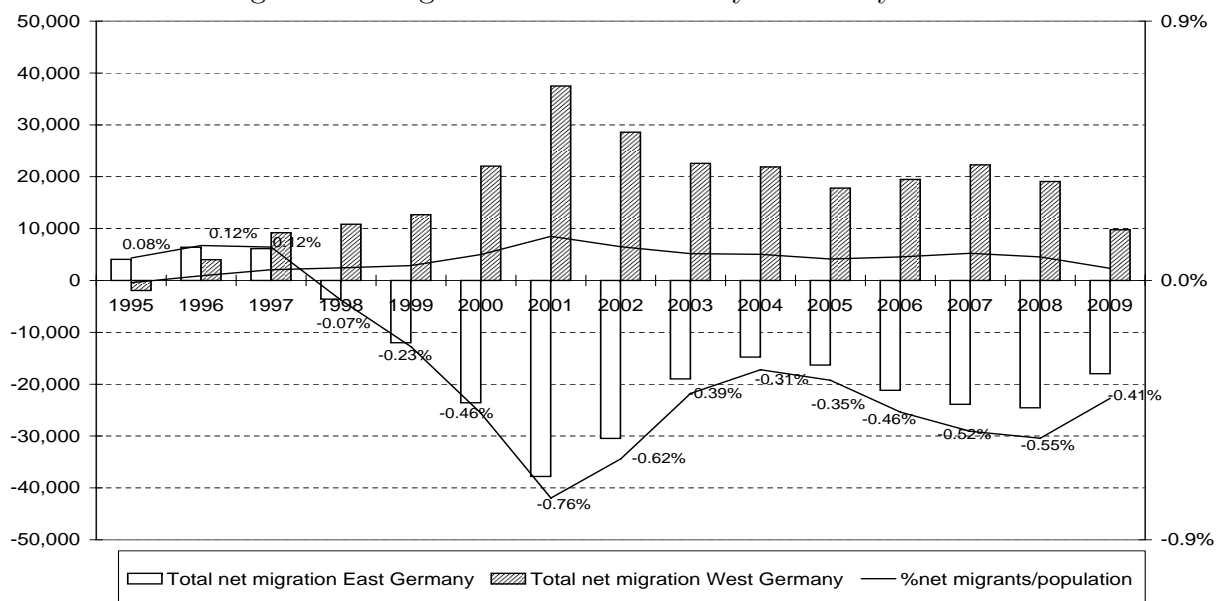
Can the attractive outside option of migrating to West Germany explain the low rate of entrepreneurship in East Germany? East Germany has been losing around 0.5% of

<sup>8</sup>In Hungary, liberalization of communist rules began in the 1970's and by the 1980's a so-called 'second economy' of privately owned businesses had developed. The private sector was officially non-existent in Czechoslovakia but more important in Poland where family farms dominated in agriculture (OECD [1992]).

<sup>9</sup>Even though formal aspects of doing business are actually more favorable in Germany than in other transition countries (World Bank [2009]). Earle and Sakova [2000] point out that high rates of unemployment and little welfare provision in transition countries might push individuals into self-employment and thus far from being successful business owners these own-account workers differ little from the unemployed. However, numbers for transition countries in refer to self-employed with employees, i.e. they operate on a larger scale than that of mere subsistence, making it unlikely that many of them are own-account workers escaping from unemployment.

its young population to migration each year since 1998, see Figure 2.1.<sup>10</sup> Between 1989 and 2002, net migration to West Germany amounted to 1.3 million people, an equivalent of 7.5% of the original population of the German Democratic Republic (Heiland [2004]). And between 1995 and 2007, 19% of East Germans aged 18 to 29 left East for West Germany. Especially young and skilled East Germans seem to migrate to West Germany (see e.g. Hunt [2006], Ragnitz [2007] or Fuchs-Schündeln and Schündeln [2009]).<sup>11</sup>

Figure 2.1: Migration within Germany of 25-50 year-olds



Data: Statistische Ämter des Bundes und der Länder [2007], excluding Berlin.

Had they stayed in East Germany would these individuals have had set up firms? To answer this question one would ideally like to consider micro-data for evidence on the possible interaction of occupational choice and migration. Table 2.2 displays statistics on East-West migration and self-employment from the unbalanced German Socioeconomic

<sup>10</sup>Compared to international migration rates, these are large numbers; e.g. current annual net migration rates from Ecuador and Mexico are 0.8% and 0.4% respectively CIA [2008]. It is very likely that numbers are upward biased as individuals might be counted more than once, migrating back and forth between East and West Germany. However, as this only applies to formal changes of residence numbers cited are not contaminated by the presence of commuters. Between 1990 and 1998, the Czech Republic and Hungary were net recipients of migration, mainly stemming from other transition countries (United Nations [2002]), while Poland lost between 0.5% and 3.9% of its original population to migration (United Nations [2002]).

<sup>11</sup>Brückner und Trübswetter [2007] on the other hand do not find that those migrating to West Germany are more educated than those staying in East Germany. However, they do find a positive self-selection of migrants according to unobserved individual characteristics.

Panel (SOEP) for 1992 to 2006. However, the sample is very small: during 14 years only 32 East German self-employed migrated permanently to West Germany, i.e. they did not move back to East Germany within the considered time frame 1996-2006. Nonetheless, these numbers suggest that around 20% fewer East than West Germans became entrepreneurs. Migration from East to West Germany was 10 times more frequent than vice versa, slightly higher than suggested by Figure 2.1. Despite a larger West German population and more self-employed, only one West German self-employed set up a business in East Germany for every four East German self-employed who migrated from East to West Germany.<sup>12</sup>

Table 2.2: GSOEP Unbalanced Panel Data on Occupation and Migration 1992-2006

|   | West (Sample A) | East (Sample C) |
|---|-----------------|-----------------|
| Ratios for 18-65 year olds in labor force<br>(number of observations) |                 |                 |
| Self-employed   | 8.8% (765)      | 7.0% (395)      |
| Migrants to East and West respectively                                | 1.1% (92)       | 10.5% (597)     |
| Migrants among Self employed  | 1.0% (8)        | 8.1% (32)       |

Migrants: individuals who moved from East to West Germany, and who did not move back within 1996-2006.

How much of the low entrepreneurship rate in East Germany is due to the initial disadvantage of a missing tradition vis-à-vis West Germans? And how much is accounted for by reunification, i.e. the fact that East Germany integrated into an established economy? The model economy, presented in the next section, tries to address these questions.

### 3 Model

There are two regions where individuals reside: East and West Germany. Individuals differ in managerial knowhow which is a combination of innate talent and entrepreneurial parental background. After one period (generation), individuals are replaced by a child of random innate talent. If the parent was an entrepreneur the child inherits information about how to run a business. East Germans are children of workers. Given their managerial knowhow, individuals decide to become entrepreneurs or workers. Paying a fixed

<sup>12</sup>Diewald et al. [2006] study life-courses of East Germans after reunification and find that transitions into self-employment between 1992 and 1996 have been “surprisingly rare”. In particular, they find that “only 4.1 percent of our sample made this step during the Window of opportunity [1/90-6/92], and 3.8 percent did so in the second period [7/92-3/96]” (pg.73).



moving cost, a fraction  $\theta$  of mobile individuals can permanently relocate and work or set up a business in the other region.<sup>13</sup> East and West Germany share goods and capital markets, but have different labor markets. There is a government that fixes East German wages as a fraction of West German wages. It also subsidizes the rental rate for capital in East Germany. Total factor productivity (TFP) in East is lower than in West Germany, ( $A_t^* < A_t$ ).

An individual derives utility from personal consumption,  $c_t$ , and bequests,  $b_t$ , left to children

$$U(c_t, b_t) = c_t^\omega b_t^{1-\omega}, \quad (3.1)$$

with  $0 < \omega < 1$  reflecting the importance of consumption relative to bequests.

Each individual is endowed with one unit of productive time and a bequest, denoted by  $x_t$ . Individuals differ in managerial knowhow ( $z_t$ ), which is made up of innate talent ( $q$ ) and parental background ( $p$ ). Innate talent is independent and identically distributed across time and individuals in  $Q = (0, \bar{q}]$ , with cdf  $F(q)$  and density  $f(q)$ .<sup>14</sup> Parental background is equal to one if one's parent was an entrepreneur and zero otherwise,  $p \in \{0, 1\}$ . Managerial knowhow is defined as

$$z_t^p = q(1 + \phi_t p),$$

where  $\phi_t \geq 0$  indicates the value that being an entrepreneur's child has for one's managerial knowhow. An entrepreneurial parent passes on information about how to run a business, which also includes non-transferable assets such as networks of suppliers, clients, or relationships with banks.

Every entrepreneur has access to the same technology. He uses his managerial knowhow ( $z_t^p$ ), workers of efficiency units ( $n_t$ ), and capital ( $k_t$ ) to produce a single output:

$$y_t = F(z_t^p, n_t, k_t) = A_t (z_t^p)^{1-\gamma+\kappa} (k_t^\nu n_t^{1-\nu})^\gamma, \quad (3.2)$$

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<sup>13</sup> $(1-\theta)$  individuals face infinitely high moving cost. I introduce this additional heterogeneity to account for reasons other than wage differentials or education (here  $\approx$  innate talent) that affect migration decisions from East to West Germany, e.g. age, family ties (see e.g. Burda [1993]). I abstain from the possibility of commuting between the two regions. Although this seems to be common among East Germans; see Hunt [2006], it is a temporary choice for most individuals while in the model occupation and migration choices are permanent.

<sup>14</sup>The distribution of innate talent  $f(q)$ , is identical for East and West Germans. Krueger and Pischke [1995] estimate very similar coefficients for returns to years of schooling for West and East Germans working in West Germany.

where  $\gamma \in (0, 1)$  is the span-of-control parameter and  $\kappa > 0$  determines the curvature of the profit function.<sup>15</sup> The capital share of production is  $\nu\gamma \in (0, 1)$ . Entrepreneurs choose optimal amounts of labor and capital in order to maximize their profits net of income taxes ( $\tau$ ). For any efficiency unit of labor they contribute  $\tau_t^u w_t$  to unemployment insurance.

For a given wage ( $w_t$ ) and rental rate ( $R_t$ ), the problem of entrepreneurs in West Germany is

$$\max_{\{n_t, k_t\}} \Pi_t = (1 - \tau)[y_t - (1 + \tau_t^u)w_t n_t - R_t k_t - I^E \eta_t^j], \quad (3.3)$$

where  $I^E$  is an indicator function that takes on value one if the individual is originally from East Germany. In this case he has to pay a fixed moving cost ( $\eta_t^j$ , with  $j = h, l$  and  $\eta_t^h = \infty$ ), deductible from taxes. Higher wages ( $w_t$ ), income taxes ( $\tau$ ), contributions to unemployment insurance ( $\tau_t^u$ ), rental rates ( $R_t$ ), and a larger span-of-control parameter ( $\gamma$ ) reduce profits. A higher level of managerial knowhow ( $z_t^p$ ) and thus also a higher value of entrepreneurial parental background increase profits.

Entrepreneurs in East Germany face the following profit maximization problem

$$\max_{\{n_t, k_t\}} \Pi_t = (1 - \tau)[A_t^* (z_t^p)^{1-\gamma+\kappa} (k_t^\nu n_t^{1-\nu})^\gamma - (1 - \lambda_t)(1 + \tau_t^u)w_t n_t - (1 - \chi_t)R_t k_t - I^W \eta_t^j]. \quad (3.4)$$

Higher wage ( $\lambda_t$ ), and rental rate ( $\chi_t$ ) discounts increase their profits. If originally from West Germany ( $I^W = 1$ ), they have to pay a moving cost ( $\eta_t^j$ ).

Workers supply labor inelastically. Their talent ( $q$ ) is transformed linearly into efficiency units of labor. Workers in West Germany earn

$$(1 - \tau_t^u - \tau)w_t q - I^E \eta_t^j. \quad (3.5)$$

Workers pay income taxes ( $\tau$ ), and mimicking the German unemployment insurance, they also contribute to the insurance scheme.

Unemployed individuals receive a fraction  $\varsigma$  of the wage rate per efficiency unit ( $v_t$ )

$$v_t = \varsigma w_t, \quad (3.6)$$

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<sup>15</sup>In Lucas [1978] wages are constant in talent and  $\kappa$  is equal to zero. Following Chang [2000], in the current paper, unemployment benefits are constant, wages are linearly increasing in talent, and thus profits need to increase more than linearly with talent, which requires setting  $\kappa > 0$ .

paid independently of an individual's talent and his region of residence.<sup>16</sup> Hence, nobody opts for migrating to the other region to become unemployed.

Individuals have complete information about the wage setting policy and with a certain probability  $\psi_t$ , they rationally expect to be involuntarily unemployed when choosing to stay and work in East Germany. No West German migrates to East Germany to become a worker, because wages are lower there. Involuntary unemployed East Germans receive unemployment insurance  $v_t$ , and hence the expected wage income is

$$(1 - \psi_t)(1 - \tau_t^u - \tau)(1 - \lambda_t)w_tq + \psi_tv_t. \quad (3.7)$$

Figure 3.2 displays a possible realization of four thresholds of occupational choices for mobile East Germans. Comparing the wage in West Germany to the expected wage in East Germany,  $\tilde{q}_t^{*,l}$  describes the East German individual who is indifferent. The cut-off  $\hat{q}_t^{*,0,l}$  indicates the East German individual indifferent between working in West or setting up a business in East Germany. Finally, the threshold  $\hat{q}_t^{*,0,l}$  describes the East German individual indifferent between setting up his business in East or West Germany.<sup>17</sup>

An individual originally from East Germany receives his bequest ( $x_t$ ) and chooses an optimal occupation, his optimal consumption and bequests in order to maximize Equation 3.1 subject to

$$\begin{aligned} c_t + b_t = & x_t(1 + R_t - \delta) + v_t I_{q < \tilde{q}_t^*} + [(1 - \psi_t)(1 - \tau_t^u - \tau)(1 - \lambda_t)w_tq + \psi_tv_t]I_{wk} + \\ & + [(1 - \tau_t^u - \tau)w_tq - \eta^j]I_{wk}I_m + \pi_t(z_t^p, A_t^*; \cdot)I_{ent} + [\pi_t(z_t^p, A_t; \cdot) - \eta^j]I_{ent}I_m, \end{aligned}$$

where  $I_{wk}, I_{ent}$ , and  $I_m$  are indicator functions that take on value one if the individual is a worker or an entrepreneur and a migrant respectively. The problem for the individual originally from West Germany is similar but excludes the option to work in East Germany. Individuals can lend their bequests to firms at the competitive rental rate,  $R_t$ . Capital depreciates at rate  $\delta$ . First order conditions lead to the following optimal decisions:

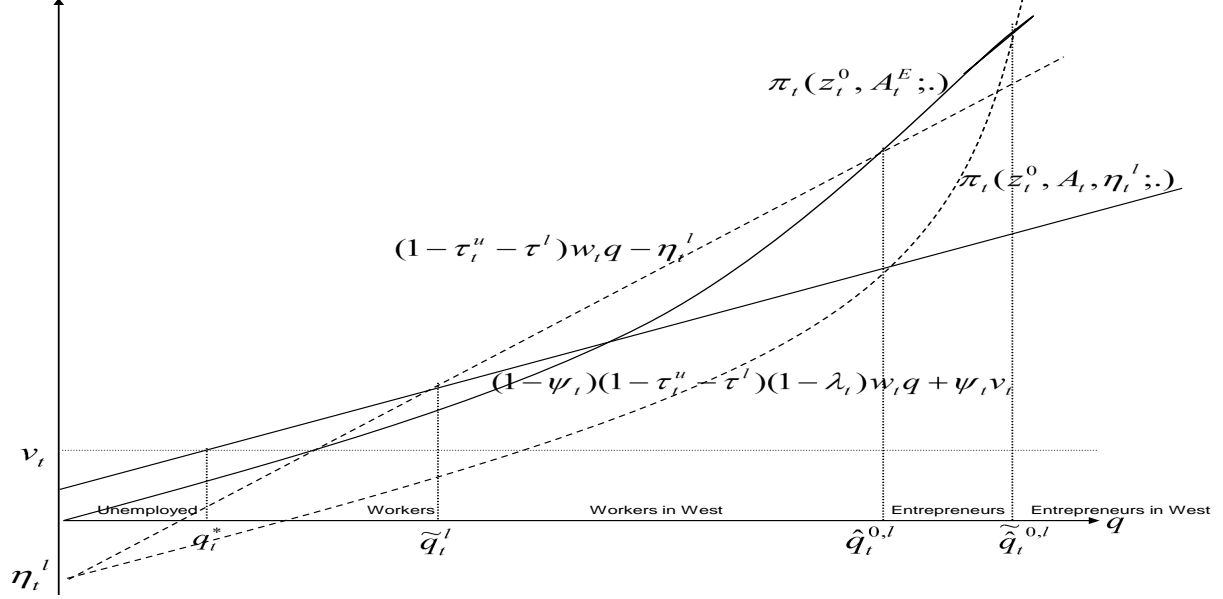
$$\begin{aligned} c_t(z_t^p; \cdot) &= \omega[x_t(1 + R_t - \delta) + \Upsilon_t(z_t^p)] \\ b_t(z_t^p; \cdot) &= (1 - \omega)[x_t(1 + R_t - \delta) + \Upsilon_t(z_t^p)], \end{aligned}$$

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<sup>16</sup>This reflect fairly well benefits policies in Germany before 2005, when they were paid without time constraints (Arbeitslosenhilfe), and when those who had never worked were eligible for social benefits (Sozialhilfe). Already in 1992, East German benefits were just 4% below those of West Germany (Bundesministerium für Arbeit und Soziales [2008]).

<sup>17</sup>For analytical solutions of occupational thresholds, see the Appendix A.3.

Figure 3.2: Possible thresholds for occupational choices for mobile East Germans.



where  $\Upsilon_t(z_t^p)$  denotes the labor income from the optimal occupational choice. The individual spends a fraction  $\omega$  of his income on consumption and leaves the rest to his child. The solution to the individual's problem also includes the optimal occupational choice.

Each period the economy's aggregate capital stock ( $X_t$ ) is determined by the sum of all bequests from last period <sup>18</sup>

$$\begin{aligned}
 X_t = & L_{t-1}^0 \int_0^{\bar{z}^0} b_{t-1}(z_{t-1}^0; \cdot) f(q) dq + L_{t-1}^1 \int_0^{\bar{z}_{t-1}^1} b_{t-1}(z_{t-1}^1; \cdot) f(q) dq + \\
 & + L_{t-1}^{0*} \int_0^{\bar{z}^0} b_{t-1}^*(z_{t-1}^{0*}; \cdot) f(q) dq + L_{t-1}^{1*} \int_0^{\bar{z}_{t-1}^1} b_{t-1}^*(z_{t-1}^{1*}; \cdot) f(q) dq, \quad (3.8)
 \end{aligned}$$

The growth rate of TFP is

$$g_t = \frac{A_t - A_{t-1}}{A_{t-1}}.$$

<sup>18</sup>Individuals during the last period were either children of workers  $L_{t-1}^0$  or children of entrepreneurs  $L_{t-1}^1$ . Given perfect capital markets and the warm glow motive for bequests, there is no need to follow the joint distribution of wealth and managerial knowhow in this economy.

Following Hassler and Rodríguez Mora [2000], this growth rate is a positive function of the innate talent of last period's entrepreneurs, relative to population size (after migration decisions have been made). For West Germany:

$$g_t = h(Q_{t-1}^-/P_t),$$

where

$$\bar{Q}_{t-1} = L_{t-1}^0 \int_{\hat{z}_{t-1}^0}^{\bar{z}^0} qf(q) dq + L_{t-1}^1 \int_{\hat{z}_{t-1}^1}^{\bar{z}_{t-1}^1} qf(q) dq,$$

with  $h$  increasing in  $\bar{Q}_{t-1}$ . Similarly for East Germany:  $g_{t+1}^* = h(\bar{Q}_{t-1}^*/P_t^*)$ .<sup>19</sup> The innate talent of last period's entrepreneurs is the sum of the innate talent of entrepreneurs who are children of workers (or unemployed)  $L_{t-1}^0$  and those who are children of entrepreneurs  $L_{t-1}^1$ . For a given share of entrepreneurs in the economy, growth is maximized when all individuals whose talent is above a certain threshold decide to start a business, irrespective of their parental background. However, if parental background is valuable, the marginal entrepreneur with an entrepreneurial family background will be of lower innate talent. In this case, an individual's occupational choice exerts a negative externality on the economy's growth rate.

The value of parental background,  $\phi_{t+1}$ , on the other hand, is defined as a decreasing function of TFP growth

$$\phi_{t+1} = a(g_t), \tag{3.9}$$

with  $a(g_t) \geq 0$  and  $\frac{\partial a(g_t)}{\partial g_t} < 0$ . Fast technological change makes today very different from yesterday, reducing the value of private information inherited from parents. In the limit, past information about how to run a business becomes completely worthless, and everyone's managerial knowhow is solely defined by their innate talent

$$\lim_{g_t \rightarrow \infty} a(g_t) = 0.$$

The government collects income taxes from entrepreneurs and workers and it fixes the discounts on East German wages ( $\lambda_t$ ) and rental rates ( $\chi_t$ ). Tax revenues finance the

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<sup>19</sup>Hassler and Rodríguez Mora [2000] reason the positive relationship between entrepreneurs' innate talent and TFP growth as follows: 'the higher the individual entrepreneur's ability to learn or understand or to deal with new or trying situations, the larger will the individual's technological innovations be. This will create a feedback mechanism whereby rapid technology growth creates an environment in which the sorting of individuals to entrepreneurial positions is based on intelligence, not on social background.' (pg.889).

difference in the rental rate to lenders, but the government cannot run a deficit.<sup>20</sup> Each period, contributions to social security have to finance unemployment benefits. Let  $K_t^{d,*}$  denote aggregate capital demand in East Germany,  $W_t$  denotes aggregate gross wages of the economy,  $\Pi_t$  are aggregate before-tax profits, and  $UB_t$  are aggregate unemployment benefits. Each period the government has to fulfill the following two constraints

$$G_t + \chi_t R_t K_t^{d,*} = \tau(\Pi_t + W_t) \quad (3.10)$$

with  $G_t \geq 0 \forall t$ , and

$$UB_t = 2\tau_t^u W_t. \quad (3.11)$$

East German wages are fixed above labor productivity and hence equilibria after reunification are characterized by involuntary unemployment in East Germany.<sup>21</sup> For an equilibrium there needs to be market clearing in the common markets for goods and capital, and in the West German labor market. The East German labor market has to be in positive net supply. Denote aggregate labor demand in East and West Germany by  $N_t^{d,*}$  and  $N_t^d$  respectively.  $N_t^{s,*}$  and  $N_t^s$  are aggregate labor supplies. Aggregate capital demand in West Germany is denoted by  $K_t^d$ . Let  $Y_t^{s,*}$  and  $Y_t^s$  be aggregate supplies of goods. Capital supply after reunification,  $X_t$  is given by the sum of the capital stocks of West and East Germany. For the capital market to clear we require

$$X_t = K_t = K_t^{d,*} + K_t^d. \quad (3.12)$$

For the goods market to clear the following has to hold

$$\begin{aligned} Y_t^{s,*} + Y_t^s &= \omega\{\Pi_t + W_t + UB_t + (1 + R_t - \delta)X_t\} + (1 - \omega)\{\Pi_t + W_t + \\ &+ UB_t + (1 + R_t - \delta)X_t\} + G_t + \chi_t R_t K_t^{d,*} + \Xi_t - (1 - \delta)X_t. \end{aligned} \quad (3.13)$$

Consumption, bequests, government consumption, and moving costs ( $\Xi_t$ ) have to equal the sum of production and the depreciated aggregate capital stock. The labor market in West Germany has to clear:

$$N_t^s = N_t^d. \quad (3.14)$$

I require the labor market in East Germany to be in positive net supply

$$N_t^{s,*} \geq N_t^{d,*}. \quad (3.15)$$

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<sup>20</sup>This restriction is never binding in the calibrated version of the model; i.e. investment aids never exceed tax revenues.

<sup>21</sup>Involuntary unemployment is assigned randomly. Entrepreneurs hire 'efficiency units' and are indifferent between hiring few very capable or more less capable workers.

When the difference between supply and demand in the East German labor market is positive, there is involuntary unemployment.<sup>22</sup> In equilibrium, the probability of involuntary unemployment expected by East Germans ( $\psi_t$ ) has to equal the realized rate

$$\psi_t = \frac{N_t^{s,*} - N_t^{d,*}}{P_{t+1}^*}. \quad (3.16)$$

Given an initial aggregate capital stock  $X_0$ , an initial fraction of entrepreneurs  $L_0^1$  in West Germany, and their talent  $Q_{-1}$ , a government policy,  $\{\tau, \varsigma, \lambda_t, \chi_t\}$ , moving costs  $\{\eta_t^j, \eta_t^{*,j}\}$  for  $j \in \{h, l\}$  and prices for labor and capital as well as a probability of involuntary unemployment in East Germany  $\{w_t, R_t, \psi_t\}$ , an equilibrium is a collection  $\{c_t(z_t^p, \eta_t^j; \cdot), c_t(z_t^p, \eta_t^{*,j}; \cdot), b_t(z_t^p, \eta_t^j; \cdot), b_t(z_t^p, \eta_t^{*,j}; \cdot), \hat{q}_t^*, q_t^*, \tilde{q}_t^j, \hat{q}_t^p, \hat{q}_t^j, \tilde{\hat{q}}_t^j, \tilde{\hat{q}}_t^p, \tau_t^u, G_t\}$  for  $p \in \{0, 1\}$  and  $j \in \{h, l\}$  such that:

1.  $\{c_t(z_t^p, \eta_t^j; \cdot), b_t(z_t^p, \eta_t^j; \cdot), q_t^*, \hat{q}_t^p, \tilde{\hat{q}}_t^{p,j}\}$  solves the individual's problem for West Germans of types  $p \in \{0, 1\}$  and  $j \in \{h, l\}$ ;
2.  $\{c_t(z_t^p, \eta_t^{*,j}; \cdot), b_t(z_t^p, \eta_t^{*,j}; \cdot), \tilde{q}_t^j, \hat{q}_t^{p,j}, \tilde{\hat{q}}_t^{p,j}\}$  solves the individual's problem for East Germans of types  $p \in \{0, 1\}$  and  $j \in \{h, l\}$  who are not unemployed;
3.  $\{c_t(z_t^p, \eta_t^{*,j}; \cdot), b_t(z_t^p, \eta_t^{*,j}; \cdot), \hat{q}_t^*\}$  solves the individual's problem for East Germans of types  $p \in \{0, 1\}$  and  $j \in \{h, l\}$  who are unemployed;
4. the rate of involuntary unemployment coincides with East Germans' expectations (i.e. equation 3.16 holds);
5. markets for goods and capital and the West German labor market clear (i.e. equations 3.12-3.14 hold);
6. the East German labor market is in positive net supply or inactive (i.e. equation 3.15 holds);
7.  $(\tau_t^u)$  is such that unemployment insurance is self-financing (i.e. equation 3.11 holds);
8. the government's budget is balanced (i.e. equation 3.10 holds with  $G_t \geq 0$ ).

**Lemma 3.1.** *There exists no equilibrium after reunification in which both, West and East German individuals become entrepreneurs in both, East and West Germany.*

Either East Germans set up businesses in East and West Germany or West Germans set up businesses in East and West Germany (see the Appendix A.2 for a proof).

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<sup>22</sup>Migration and occupational choices are only altered until expected involuntary unemployment is equal to the realized rate. An individual who finds himself involuntarily unemployed cannot reconsider his choice.

## 4 Calibration

To assign values to parameters for innate talent, preferences, technology, and those governing the role of parental background and the link between entrepreneurship and growth, I consider the balanced growth path of a model economy with one region; i.e. West Germany prior to 1989.<sup>23</sup> Other parameters are assigned considering data for Germany after reunification.

The following parameters are fixed based on available evidence. For the mean log-talent ( $\mu$ ) and its dispersion ( $\sigma$ ), I use values of 2.11 and 0.58 respectively as estimated by Chang [2000] for the US wage distribution of non-supervisory workers.<sup>24</sup> The span-of-control parameter ( $\gamma$ ) is set to 0.865, the midpoint of values estimated by Burnside et al [1995]. The average over 1970-1989 for the ratio of depreciation of fixed private capital over gross private capital stock gives me an annual depreciation rate ( $\delta$ ) of 4.6% (Statistisches Bundesamt [2006]). In 1991, wages in East Germany were set to 50% of West German wages, by 1995, they were at 70% and by 2007 they had reached about 80% of West German wages, see Sinn [2002]. I use the intermediate value and set  $\lambda_t$  to 0.3.<sup>25</sup> In 1989, the population of the German Democratic Republic was equal to one fourth of the West German population, see Statistische Bundesamt [2006]. The per capita capital stock of East Germany in 1991 was around 43% the one of West Germany, see Statistische Bundesamt [2006] and [2011]. Table 4.3 displays all parameter values.

Two central functions of the model are: i)the relationship between entrepreneurs' innate talent and TFP growth and ii)the relationship between TFP growth and the value of entrepreneurial parental background. The first function is specified as follows:

$$g_t = h(\bar{Q}_{t-1}) = \frac{1}{(1 + e^{-\bar{Q}_{t-1}})^{1/\alpha}},$$

with  $\alpha \geq 0$  for a positive relationship. I choose  $\alpha$  equal to 0.22 to match an average GDP per capita growth rate of 2.26% for West Germany between 1970-1989 (Statistisches

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<sup>23</sup>For a description of this economy, see Appendix A.4. Alesina and Fuchs-Schündeln [2007] find that it takes two generations for East German preferences to converge to those of West Germans. Assuming a different value for the preference parameter  $\omega$ , for East Germans does not have a direct effect on their occupational choices.

<sup>24</sup>The German labor market is characterized by more regulation and lower labor force participation rate of low-skilled individuals, making the use of parameters from a West German wage distribution for a distribution of talents less adequate.

<sup>25</sup>Even though by 2007 around 30% of firms in East Germany had opted out of collective agreements (IAB Betriebspanel [2008]), on average East German labor costs per hour in 2008 were only 27.9% lower compared to West German labor costs (Statistisches Bundesamt [2011]).



Table 4.3: Parameters

| <b>Parameters fixed</b>  | <b>Source</b>                 | <b>Value</b>                   |
|--|-------------------------------|--------------------------------|
| <i>West Germany prior 1989</i>                                     |                               |                                |
| Mean log talent ( $\mu$ )  | Chang (2000)                  | 2.110                          |
| Dispersion in log talent ( $\sigma$ )                              | Chang(2000)                   | 0.580                          |
| Span-of-control ( $\gamma$ )                                       | Burnside et al(1995)          | 0.865                          |
| Annual depreciation rate ( $\delta$ )                              | Stat. Bundesamt(2006)         | 0.046                          |
| <i>Reunification</i>   |                               |                                |
| Discount on East German wages ( $\lambda_t$ )                      | Sinn(2002)                    | 0.300                          |
| Ratio of East to West German population                            | Stat. Bundesamt (2006)        | 0.250                          |
| Ratio of east to West German capital stock                         | Stat. Bundesamt(2006)         | 0.430                          |
| <b>Parameters calibrated</b>                                       | <b>Target</b>                 |                                |
| <i>West Germany prior 1989</i>                                     |                               |                                |
| Relating entrepreneurs' talent to growth ( $\alpha$ )              | GDP growth                    | 0.220                          |
| Relating growth to Value of parental background ( $\bar{\sigma}$ ) | Intergenerational mobility    | 0.957                          |
| Importance of Capital ( $\nu$ )                                    | Capital share                 | 0.347                          |
| Weight of consumption in utility ( $\omega$ )                      | Capital-output ratio          | 0.803                          |
| Unemployment Benefit ( $\varsigma$ )                               | Unemployment rate             | 2.649                          |
| Curvature of profit function ( $\kappa$ )                          | Business ownership rate       | 0.101                          |
| Income tax ( $\tau$ )  | Tax revenues to GDP           | 0.175                          |
| <i>Reunification</i>   |                               |                                |
| Ratio of East to West German TFP                                   | Relative labor productivities | 0.745                          |
| Discount on East German rental rate                                | Financial aids to GDP         | 0.201                          |
| Fraction of mobile Germans ( $\theta$ )                            | Migraton of East Germans      | 0.500                          |
| Moving costs for mobile Germans ( $\eta_t^l$ )                     | Unemployment East             | $0.42 \frac{Y_{t-1}}{P_{t-1}}$ |

Bundesamt [2006]). The function  $a(g_t)$  is specified as

$$\phi_{t+1} = a(g_t) = \frac{\bar{\phi}}{1 + g_t},$$

where the parameter  $\bar{\phi}$  is assigned a value of 0.957 to match that 60% of West German entrepreneurs have an entrepreneurial parent (Pistrui et al [2000]).<sup>26</sup>

The importance of capital ( $\nu$ ) is calibrated to a value of 0.3468 in order to target a capital share of 0.3 as reported by the Deutsche Bundesbank [2001] for West Germany for 1970 to 1989. I choose a value of 0.8035 for the relative importance of consumption in utility ( $\omega$ ) to match an average capital-output ratio of 2.32 for West Germany for 1970-1989 (Statistisches Bundesamt [2006]). The unemployment benefit as a fraction of the wage

<sup>26</sup>Zero correlation of talent between parents and children requires assigning a relatively high value to  $\bar{\phi}$  in order to be able to account for the persistence in occupations. For a discussion of occupational mobility in West Germany see the Appendix A.5.

Table 4.4: Calibration targets and model values

| <b>Targeted moments</b>                          | <b>Source</b>                | <b>Data</b> | <b>Model</b> |
|--|------------------------------|-------------|--------------|
| <i>West Germany prior 1989</i>                   |                              |             |              |
| Annual growth rate of GDP (1971-89)              | Stat. Bundesamt(2006)        | 0.0226      | 0.0226       |
| Entrepreneurs with entrepreneurial parent (1997) | Pistrui et al(2000)          | 0.6000      | 0.6002       |
| Capital share (1970-89)                          | Bundesbank(2001)             | 0.3000      | 0.3000       |
| Capital-output ratio (1970-89)                   | Stat. Bundesamt(2006)        | 2.3200      | 2.3231       |
| Unemployment rate (1970-89)                      | BfA(2007)                    | 0.0540      | 0.0540       |
| Business ownership rate (1972-89)                | Compendia(2002)              | 0.0690      | 0.0692       |
| Tax revenues to GDP (1975-1990)                  | OECD(2006)                   | 0.1220      | 0.1216       |
| <i>Reunification</i>                             |                              |             |              |
| East to West German labor productivity           | Stat. Bundesamt(2006)        | 0.6800      | 0.6659       |
| Investment aid to West German GDP                | Wurzel(2001)                 | 0.0100      | 0.0088       |
| East-West net migration                          | Heiland(2004)                | 0.0750      | 0.0780       |
| East German unemployment                         | Sachverst.(2007)             | 0.2700      | 0.2701       |
| <b>Not targeted moments</b>                      |                              |             |              |
| <i>West Germany prior 1989</i>                   |                              |             |              |
| Annual rate of capital (1970-89)                 | UN Stats(2010)               | 0.0520      | 0.0659       |
| Average firm size, workers (1972-89)             | Compendia(2002)              | 11.0000     | 12.6675      |
| Unemployment benefit to mean wage (1991)         | BM Arbeit und Soziales(2008) | 0.2900      | 0.2830       |
| Contribution to unemployment insurance (1970-89) | Glismann and Schrader(2002)  | 0.0145      | 0.0087       |
| <i>Reunification</i>                             |                              |             |              |
| Output per capita East to West                   | Stat. Aemter(2011)           | 0.6000      | 0.5156       |
| Unemployment rate                                | BfA(2007)                    | 0.0980      | 0.0943       |
| Average firm size East to West                   | Stat. Bundesamt(2008)        | 1.0400      | 1.0409       |
| Unemployment benefits paid in East               | BfA(2006)                    | 0.3540      | 0.5279       |

rate per efficiency unit ( $\varsigma$ ) is calibrated to 2.649 to target an average unemployment rate of 5.4% for West Germany between 1970 and 1989 (Bundesagentur für Arbeit [2007]).<sup>27</sup> The curvature of the profit function ( $\kappa$ ) is assigned a value of 0.101 to match a business ownership rate of 6.9% for West Germany for 1972 to 1989, see Entrepreneurs International (Compendia [2002]).<sup>28</sup> The income tax rate ( $\tau$ ) is calibrated to 0.175 to match a ratio of taxes on income and profits as percentage of GDP of 12.2% for West Germany for 1975 to 1990 (OECD [2006]).

<sup>27</sup>I use the official unemployment rate because unofficial unemployment rates that include the “hidden unemployed”, (i.e. individuals who do not appear as officially unemployed due to some form of active labor market policy (training programs, wage subsidies, early retirement schemes) but whose income comes to a large extent in form of subsidies) are not available for years prior to 1993 because active labor market schemes have mostly been in place since 1990.

<sup>28</sup>Data is available from 1972 onwards.

The remaining parameters are calibrated to the model economy with two regions. I set the initial ratio of East to West German TFP to 0.7451 to match an average ratio of East to West German labor productivity measured as GDP per employed person of 68%. This measure rose from 35% in 1991 to 78% in 2007 (Statistisches Bundesamt [2006]). The discount on the rental rate of capital in East Germany  $\chi_t$ , is calibrated to a value of 0.201 to match a ratio of investment-aid to West German GDP of 1%, see Wurzel [2001].<sup>29</sup> The fraction of mobile individuals  $\theta$ , is assigned a value of 0.5 to a net migration rate of 7.5%, see Heiland [2004]. I set moving costs for mobile Germans  $\eta_t^l$ , to a value of 42% of West German per capita GDP of a pre-reunification generation in the model in order to match an unemployment rate of 27%.<sup>30</sup>

The model for West Germany is also able to generate un-targeted statistics in line with data. The rental rate of capital in the model is 6.6%, somewhat higher than the deflated average of German government long-term bond yields over 1970-1989 of 5.2% (IMF and Heston et al. [2011] and United Nations Statistics Division [2010]). Average firm size is 12.7 workers per firm, which is slightly higher than the 11 workers per West German firm in Entrepreneurs International (Compendia [2002]) for 1972-1989. The ratio of unemployment benefits to mean nominal wage in the model is 28.3% and thus comes very close to the ratio of monthly social subsidies to the monthly nominal average equivalent income of 29% for West Germany for 1991 (Bundesministerium für Arbeit und Soziales [2008] and DIW [1995]).<sup>31</sup> Contributions to unemployment insurance with employers and employees each paying 0.87% of gross wages are somewhat lower in the model than in the data. According to Glismann and Schrader [2002] contributions to unemployment insurance by each employer and employee in West Germany between 1970 and 1989 were equal to 1.45% of gross income.

Table 4.4 also presents un-targeted statistics for the two region model. The per capita

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<sup>29</sup>Between 1991 and 1995 annual public transfers for support to enterprises and business-near infrastructure were in the range of 0.63% and 0.99% of West German GDP. These do not include special depreciation allowances, debt servicing expenditure and credits. The estimated value of  $\chi_t = 0.201$  is somewhat in line with Ragnitz [2002] who finds that in 2000 most firms in East Germany still received investment aids of around one quarter of their investment costs.

<sup>30</sup>The Sachverständigenrat [2007] publishes numbers of registered and hidden unemployed. Between 1993 and 2003, the number of hidden unemployed in East Germany was on average equal to 55% of registered unemployed; with an average official East German unemployment rate for 1991 to 2007 of 17.5% (Bundesagentur für Arbeit [2008]) this adds up to a rate of 27%. Moving costs for East Germans  $\eta_t^{*,j}$  are assumed to be equal to moving costs for West Germans. Immobile Germans face infinitely high moving costs,  $\eta_t^h = \infty$ .

<sup>31</sup>According to a letter from the Bundesministerium für Arbeit und Soziales, equivalent data for the time period 1970 to 1989 is not available.

GDP ratio for East to West Germany of 52% is eight percentage points lower than the average ratio of 60% for 1991 to 2008 in the data (Statistische Ämter der Länder [2011]). Entrepreneurs in East Germany hire on average 0.6 workers more than entrepreneurs in West Germany. This is in line with data on slightly larger East German firms, see Statistische Bundesamt [2008]. Aggregate unemployment in the model is 9.8%, equal to the average unemployment rate between 1992 and 2007 (Bundesagentur für Arbeit [2007]) Data by the Bundesagentur für Arbeit [2006] show a cross subsidizing of unemployment benefits between East and West Germany, but to a somewhat lesser extent than in the model.

## 5 Results

Due to the missing tradition of entrepreneurship, East Germans' managerial knowhow is lower than that of West Germans. Wages are fixed above labor productivity and free migration to West Germany implies an attractive outside option for East Germans. As a result, in East Germany few individuals become entrepreneurs, production is low and unemployment is high. I perform two counterfactual experiments to quantify the effects of the missing tradition of entrepreneurship and of the German reunification on economic outcomes. The first experiment assumes that between 1949 and 1989 East Germany had maintained an entrepreneurial tradition, i.e. there is an equally sized fraction of individuals with entrepreneurial parents in East and West Germany. The second experiment tests what would have happened if in 1990, East Germany had remained an independent country, i.e. migration would have been restricted, wages would have adjusted to clear the East German labor market and there would have been no subsidies. Table 5.5 displays results of these two experiments next to the ones from the benchmark model.<sup>32</sup>

With a similar tradition in entrepreneurship as in West Germany, managerial knowhow in East and West Germany would have been the same. Hence, around 37% more individuals would have set up their own business in East Germany. They would have produced and created jobs. GDP per capita would have been around 16% higher. Unemployment would have been reduced by almost 10 percentage points, and involuntary unemployment eliminated. Hence, the missing tradition of entrepreneurship can account for almost 10 percentage points of the gap in GDP per capita between East and West Germany. Around 35% of unemployment can be explained by this mechanism. Improved job opportunities imply that fewer East Germans would have migrated to West Germany. Without the initial disadvantage in terms of managerial knowhow, relatively more East Germans would

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<sup>32</sup>For results on West Germany's and aggregate economic outcomes see Table A2 of Appendix.

Table 5.5: Results

|                          | benchmark<br>economy | entrepreneurial<br>tradition<br>in East | independent<br>East<br>Germany |
|--------------------------|----------------------|---|--------------------------------|
| Entrepreneurs in East    | 0.0524               | 0.0720                                  | 0.0539                         |
| TFP growth East          | 0.0141               | 0.0134                                  | 0.0166                         |
| GDP per capita East      | 100.0000             | 116.6294                                | 113.2342                       |
| GDP per capita East-West | 0.5156               | 0.6111                                  | 0.5891                         |
| Unemployment East        | 0.2701               | 0.1755                                  | 0.2033                         |
| of those involuntary     | 0.0915               | 0.0000                                  | 0.0000                         |
| Migration to West        | 0.0780               | 0.0567                                  | 0.0000                         |
| of those workers         | 0.8022               | 0.6244                                  | -                              |
| of those entrepreneurs   | 0.1978               | 0.3756                                  | -                              |
| Wage East to West        | 0.6659               | 0.7106                                  | 0.6941                         |
| Unemployment insurance   | 0.0173               | 0.0140                                  | 0.0150                         |

To maintain aggregate managerial knowhow at the benchmark level, I adjust  $\mu$  to 2.10071 for the first experiment. Note that in this case average innate intelligence is lower - leading to reduced TFP growth. Maintaining individuals' decisions but using the distribution of innate intelligence from the benchmark model with  $\mu = 2.11$  leads to a slightly higher TFP growth rate of 1.36%. To obtain equilibrium, the discount on wages  $\lambda_t$  has to be adjusted to 0.2971.

have set up a business in West Germany. Therefore, the missing tradition can account for around 27% of migration. The relative average East German wage would have increased and together with reduced unemployment this would have allowed for lower contributions to unemployment insurance. On the other hand, entrepreneurial parental background in East Germany would have induced individuals of lower innate talent to set up their own business and thus TFP growth would have been lower.

If instead East Germany had remained an independent country, similar to other transition countries, TFP growth would have been 18% higher than the benchmark case. However, given the missing tradition, entrepreneurship would have increased only slightly by 3%. GDP per capita would have been around 13% higher and unemployment 7 percentage points lower. Given very different starting points in 1990, these numbers can only be compared tentatively to those for other transition countries. For instance, similar to the results of this experiment, between 1991 and 2009 GDP per capita growth in Poland was on average 24% higher than in East Germany (with Berlin - see Figure A-1). Entrepreneurship in other transition countries, on the other hand, was at least 15% higher than in East Germany, see Table 2.1. According to OECD statistics, between 1990 and 2012, average unemployment in Poland was 13%, higher than in West Germany but lower than in East Germany. According to Eurostat, between 2000 and 2010 all transition countries improved their relative GDP per capita with respect to that of the EU-27 by

at least 10 percentage points, while relative GDP per capita in all East German states stagnated.

The effects of this last experiment can be decomposed by considering the three experiments that make up the scenario of an independent East Germany: (1) restricting migration (2) eliminating subsidies (3) allowing for flexible wages. Table 5.6 displays these decomposition results next to the ones for an independent East Germany.<sup>33</sup>

Table 5.6: Decomposition of results

|                          | independent<br>East<br>Germany | no<br>migration | no<br>subsidies | flexible<br>wages |
|--------------------------|--------------------------------|-----------------|-----------------|-------------------|
| Entrepreneurs in East    | 0.0539                         | 0.0553          | 0.0315          | 0.0566            |
| TFP growth East          | 0.0166                         | 0.0170          | 0.0108          | 0.0157            |
| GDP per capita East      | 113.2342                       | 125.5497        | 45.9840         | 115.1758          |
| GDP per capita East-West | 0.5891                         | 0.6659          | 0.2299          | 0.5986            |
| Unemployment East        | 0.2033                         | 0.1595          | 0.6591          | 0.1743            |
| of those involuntary     | 0.0000                         | 0.0000          | 0.4542          | 0.0000            |
| Migration to West        | 0.0000                         | 0.0000          | 0.1669          | 0.0453            |
| of those workers         | -                              | -               | 0.8852          | 0.7756            |
| of those entrepreneurs   | -                              | -               | 0.1148          | 0.2244            |
| Wage East to West        | 0.6941                         | 0.7426          | 0.6470          | 0.6818            |
| Unemployment insurance   | 0.0150                         | 0.0139          | 0.0280          | 0.0130            |

To obtain equilibria in the second experiment (no migration), the discount on wages  $\lambda_t$  has to be adjusted to 0.294.

These experiments reveal that migration to West Germany together with the wage setting policy account for most of the negative effects of reunification on economic outcomes in East Germany. Contrary to conventional wisdom, flexible wages would have reduced migration because the threat of involuntary unemployment would have disappeared. Expected wages for those staying in East Germany would have increased. Based on the calibration of the model, around 545,000 fewer East Germans would have migrated to work or set up a business in West Germany. Migration drew in the most talented individuals that otherwise would have contributed to East German TFP growth.

Subsidies to the rental rate of capital on the other hand, induced individuals to set up their

<sup>33</sup>Additional results for economic outcomes of West Germany and the aggregate are displayed in Table A3 of the Appendix.

own business, create jobs, and produce. Without subsidies, almost 40% fewer individuals would have set up a business in East Germany. Relative GDP per capita East to West would have been around 23% - lower than the ratio of 33% in 1991 (Statistische Ämter der Länder [2014]). More than half of the East German population would have been unemployed. Out of fear for involuntary unemployment, migration would have doubled. However, the positive effects of flexible wages and migration restrictions on East German economic outcomes overall dominate. These results suggest that – given the missing tradition in entrepreneurship – the optimal policy for East German economic outcomes would have been an independent East Germany with flexible wages and important subsidies to capital.

## 6 Conclusion

East Germany's post-1989 experience has been different from that of other transition countries. It was integrated into an established economy and received a ready-made regulatory framework and massive financial aids. However, East German economic outcomes have been lower than expected. There are significantly fewer entrepreneurs and economic growth is lower compared to other transition economies. This paper tests how much low entrepreneurship and its impact on economic outcomes can be accounted for by the missing tradition and how much is due to features of reunification - free migration to West Germany, fixed wages and capital subsidies. The missing tradition in entrepreneurship implied an initial disadvantage for East Germans in terms of managerial knowhow. Results suggest that this disadvantage can account for almost 10 percentage points in unemployment and in the output gap between East and West German GDP per capita. Results from an alternative counterfactual experiment suggest that two key features of reunification hindered East Germany's economic take-off: migration possibilities to West Germany and fixed wages. Subsidies, on the other hand, strongly dampened the negative effects of the former.

Twenty years after reunification, a productivity gap between East and West Germany remained. As a solution, many firms in East Germany had opted out from collectively bargained wages. However, as of January 2015, all German firms will have to pay a universal minimum wage of 8.50 Euros per hour. Recently, employer representatives in the hospitality sector in East Germany have tried to negotiate lower wages. But again arguments of fairness were employed to defend a universal minimum wage across German regions. This paper suggest that it is important to take into account general equilibrium effects on entrepreneurship and migration is important. Against commonly held beliefs,

a slightly lower East German wage could be more favorable to East German economic outcomes.

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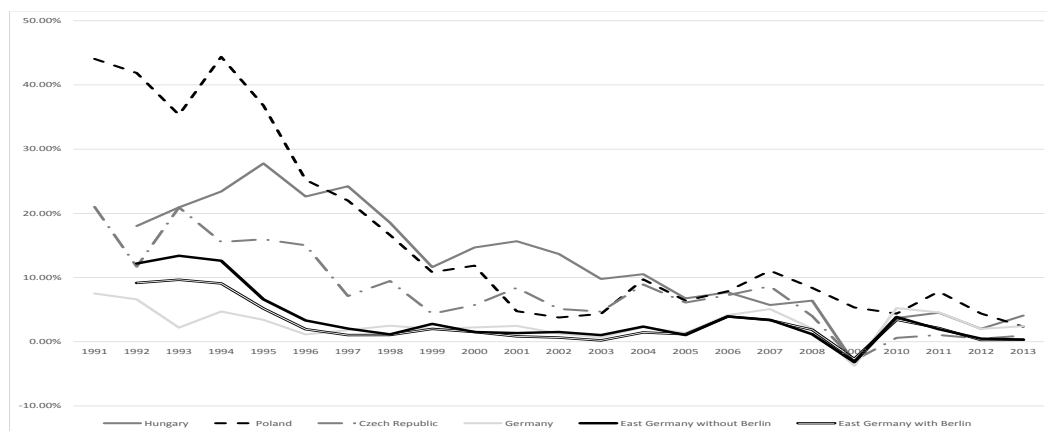
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## A Appendix

### A.1 Figures

Figure A-1: Growth Rates of Real GDP per Capita



Data: OECD [2014], Statistische Ämter der Länder [2014] (for East Germany).

Figure A-2: Sensitivity Analysis for  $\alpha$  and  $\bar{\phi}$ —Growth Rate ( $g$ )

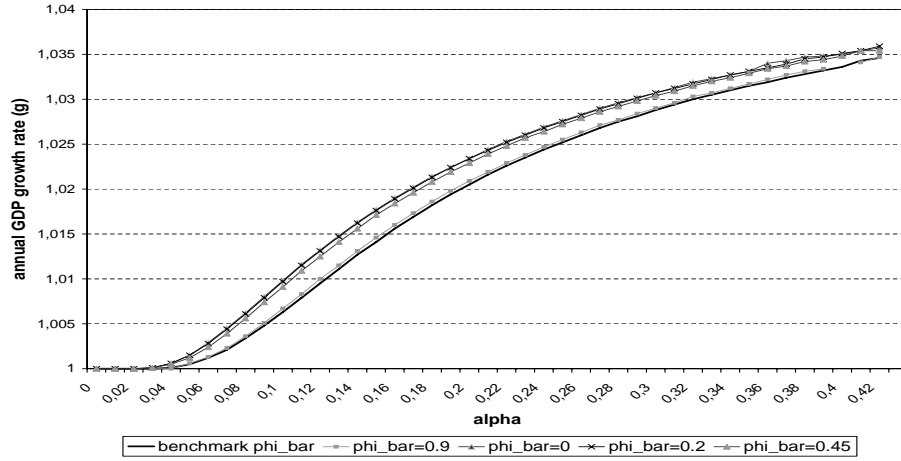
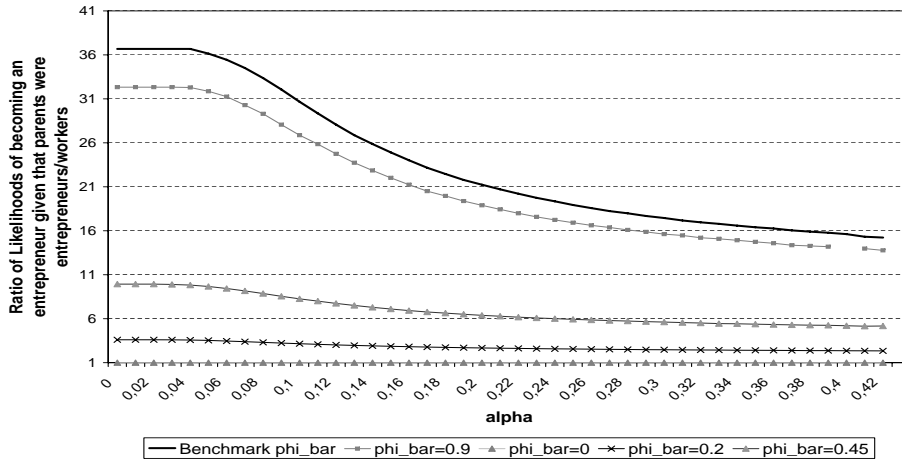


Figure A-3: Sensitivity Analysis for  $\alpha$  and  $\bar{\phi}$  - Ratio of Likelihoods



## A.2 Proof of Lemma 3.1

The threshold of managerial knowhow that determines who is indifferent between setting up a business in East or West Germany only exists for West German individuals if  $(1 - \lambda_t)^{(1-\nu)\gamma}(1 - \chi_t)^{\nu\gamma} < \frac{A_t^* 1-\gamma}{A_t}$  and for East Germans this threshold only exists if  $(1 - \lambda_t)^{(1-\nu)\gamma}(1 - \chi_t)^{\nu\gamma} > \frac{A_t^* 1-\gamma}{A_t}$ . These conditions are mutually exclusive.

### A.3 Thresholds of Occupational Choices

The cut-off value,  $\tilde{q}_t^j$ , describes the East German individual who is indifferent between working in East or West Germany

$$\tilde{q}_t^j = \frac{\psi_t \varsigma w_t + \eta_t^{*,j}}{(1 - \tau_t^u - \tau)(\psi_t + \lambda_t - \psi_t \lambda_t) w_t}.$$

Comparing their potential wage in West Germany to the profits they can make as entrepreneurs, East Germans set up their own business in East Germany whenever,

$$\pi_t(z_t^p, A_t^*; \cdot) \geq (1 - \tau_t^u - \tau) w_t q - \eta_t^{*,j}.$$

Note that the profit function for entrepreneurs in East Germany and the function for wage income in West Germany might cross twice. Initially being an entrepreneur in East Germany is always better than working in West Germany, due to fixed moving costs. With increasing talent, wage income increases and individuals are able to pay the fixed costs and thus might prefer to work in West Germany instead of setting up a business in East Germany. Given increasing returns to knowhow there might exist a second threshold where setting up a business in East Germany becomes again more attractive as opposed to working in West Germany.

The cut-off value,  $\tilde{q}_t^{p,j}$  describes the East German individual who is indifferent between setting up his business in East or West Germany

$$\tilde{q}_t^{p,j} = \tilde{z}_t^{*,p,j} = \left( \eta_t^{*,j} (w_t (1 + \tau_t^u))^{\frac{(1-\nu)\gamma}{1-\gamma}} R_t^{\frac{\nu\gamma}{1-\gamma}} \Psi_t^{-1} \left( 1 - \frac{A_t^*}{A_t (1 - \lambda_t)^{\frac{(1-\nu)\gamma}{1-\gamma}} (1 - \chi_t)^{\frac{\nu\gamma}{1-\gamma}}} \right)^{-1} \right)^{\frac{1-\gamma}{1-\gamma+\kappa}},$$

where  $\Psi_t = A_t^{\frac{1}{1-\gamma}} (1 - \gamma) (\gamma (1 - \nu))^{\frac{\gamma}{(1-\gamma)}} (\frac{\nu}{1-\nu})^{\frac{\nu\gamma}{1-\gamma}}$ . This threshold of occupational choice is independent of the individual's parental background,  $\tilde{q}_t^{p,j} = \tilde{z}_t^{*,p,j} = \tilde{z}_t^{*,j}$ . It is positive only if  $(1 - \lambda_t)^{(1-\nu)\gamma} (1 - \chi_t)^{\nu\gamma} > \frac{A_t^*}{A_t}^{1-\gamma}$ . The cut-off value  $\hat{q}_t^*$ , describing the East German individual who is indifferent between working in East Germany or being unemployed is given by

$$\hat{q}_t^* = \frac{\varsigma}{(1 - \tau_t^u - \tau)(1 - \lambda_t)}.$$

The marginal worker from West Germany,  $q_t^*$  is indifferent between working or being unemployed  $q_t^* = \frac{\varsigma}{(1 - \tau_t^u - \tau)}$ . Note that some of the comparisons among all occupations that individuals make in order to make their optimal choice are omitted in Figure 3.2.

The cut-off value of innate talent ( $\hat{q}_t^p$ ) that describes the West German individual who is indifferent between working or setting up a business is given by

$$\hat{q}_t^p = \left( (1 + \phi_t p)^{\frac{-(1+\gamma+\kappa)}{1-\gamma}} w_t^{\frac{1-\nu\gamma}{1-\gamma}} R_t^{\frac{\nu\gamma}{1-\gamma}} \Psi_t^{-1} (1 - \tau)^{-1} (1 + \tau_t^u)^{\frac{\gamma-\nu\gamma}{1-\gamma}} (1 - \tau_t^u - \tau) \right)^{\frac{1-\gamma}{\kappa}}.$$

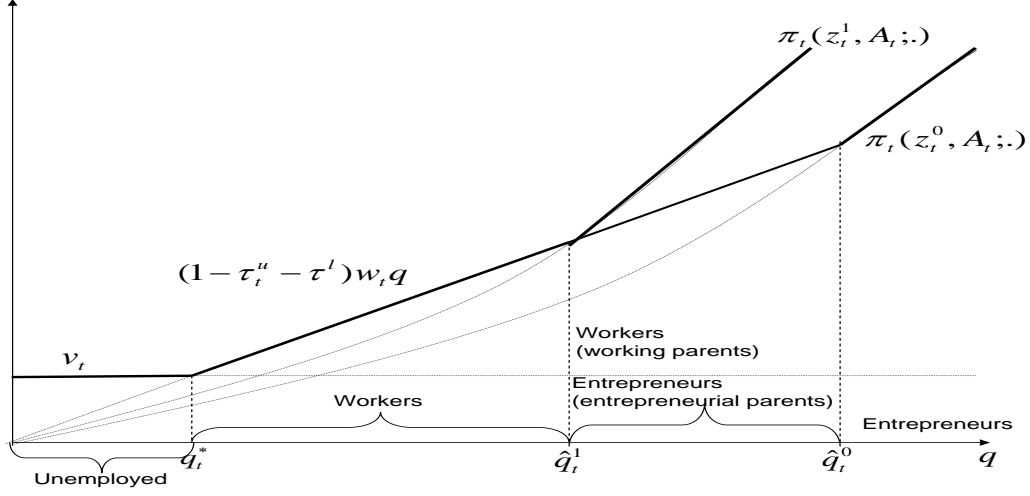
This threshold decreases in the value of entrepreneurial parental background. When TFP grows fast, the value of entrepreneurial parental background vanishes ( $\phi_t \rightarrow 0$ ) and the difference in talent between the two marginal entrepreneurs from different family backgrounds disappears. Whenever  $\pi_t(z_t^p, A_t^*, \eta_t^j; \cdot) \geq (1 - \tau_t^u - \tau)w_t q$ , West Germans decide to set up a business in East Germany instead of working in West Germany. However, the threshold resulting from this choice is only relevant whenever the marginal entrepreneur who sets up his business in East Germany exists and has less knowhow than the marginal entrepreneur in West Germany. Individuals in West Germany also compare unemployment benefits to profits from setting up a business in East Germany. Whenever  $\pi_t(z_t^p, A_t^*, \eta_t^j; \cdot) \geq v_t$ , they decide to set up a business in East Germany instead of being unemployed. Only if the marginal entrepreneur who sets up his business in East Germany exists and has less knowhow than the marginal entrepreneur in West Germany and also less knowhow than the marginal worker does this choice become relevant.

## A.4 Model - West Germany before reunification

In the model economy with one region - West Germany - individuals have no migration choices and they decide among three occupations: unemployed, worker, or entrepreneur. Figure A-4 displays the resulting thresholds of occupational choice for individuals from an entrepreneurial family background and for those from a working family background. Individuals with a lower talent than  $q_t^*$  stay unemployed while those with talent between  $q_t^*$  and  $\hat{q}_t^1$  become workers. Individuals with a higher talent than  $\hat{q}_t^1$  and parental background in entrepreneurship set up a business. Those of equal talent but without parental background in entrepreneurship become workers. Everyone with a higher talent than  $\hat{q}_t^0$  becomes an entrepreneur. Tax revenues are used for pure government consumption only,



Figure A-4: Thresholds of Occupational Choice - West Germany prior to 1989



and each period the government has to fulfill the following two constraints

$$\begin{aligned}
 G_t = & \tau \left\{ L_t^1 \int_{\hat{z}_t^1}^{\bar{z}_t^1} (y_t - w_t(1 + \tau_t^u)n_t - R_t k_t) f(q) dq + \right. \\
 & + L_t^0 \int_{\hat{z}_t^0}^{\bar{z}_t^0} (y_t - w_t(1 + \tau_t^u)n_t - R_t k_t) f(q) dq + \\
 & \left. + L_t^1 \int_{\hat{q}_t}^{\hat{z}_t^1} w_t q f(q) dq + L_t^0 \int_{\hat{q}_t}^{\hat{z}_t^0} w_t q f(q) dq \right\}, \quad (\text{A-1})
 \end{aligned}$$

and

$$v_t \int_0^{\hat{q}_t} f(q) dq = 2\tau_t^u w_t \left( L_t^0 \int_{\hat{q}_t}^{\hat{z}_t^0} q f(q) dq + L_t^1 \int_{\hat{q}_t}^{\hat{z}_t^1} q f(q) dq \right). \quad (\text{A-2})$$

In equilibrium all three markets for goods, capital, and labor must clear. Denote by  $n_t(z_t^p; \cdot)$  and  $k_t(z_t^p; \cdot)$  optimal demands for labor and capital services by an entrepreneur born in period  $t$  with managerial knowhow  $z_t^p$ . For the labor market to clear aggregate labor demand has to be equal to aggregate labor supply

$$N_t^d = L_t^0 \int_{\hat{z}_t^0}^{\bar{z}_t^0} n_t(z_t^0; \cdot) f(q) dq + L_t^1 \int_{\hat{z}_t^1}^{\bar{z}_t^1} n_t(z_t^1; \cdot) f(q) dq, \quad (\text{A-3})$$

$$N_t^s = L_t^0 \int_{\hat{q}_t}^{\hat{z}_t^0} qf(q)dq + L_t^1 \int_{\hat{q}_t}^{\hat{z}_t^1} qf(q)dq.$$

For the capital market to clear aggregate capital demand has to equal aggregate capital supply

$$K_t^d = L_t^0 \int_{\hat{z}_t^0}^{\bar{z}^0} k_t(z_t^0; \cdot) f(q) dq + L_t^1 \int_{\hat{z}_t^1}^{\bar{z}^1} k_t(z_t^1; \cdot) f(q) dq = X_t. \quad (\text{A-4})$$

With  $y_t(z_t^p; \cdot)$  being the supply of goods by any entrepreneur of knowhow  $z_t^p$ , for market clearing in the goods market consumption, bequests, and government consumption have to equal the sum of production and the depreciated capital stock

$$\begin{aligned} & L_t^0 \int_{\hat{z}_t^0}^{\bar{z}^0} y_t(z_t^0; \cdot) f(q) dq + L_t^1 \int_{\hat{z}_t^1}^{\bar{z}^1} y_t(z_t^1; \cdot) f(q) dq = \\ & = L_t^0 \int_0^{\bar{z}^0} (c_t(z_t^0; \cdot) + b_t(z_t^0; \cdot)) f(q) dq + L_t^1 \int_0^{\bar{z}^1} (c_t(z_t^1; \cdot) + b_t(z_t^1; \cdot)) f(q) dq - \\ & \qquad \qquad \qquad - X_t(1 - \delta) + G_t. \quad (\text{A-5}) \end{aligned}$$

**Equilibrium** Given an initial capital stock,  $X_0$ , an initial fraction of entrepreneurs  $L_0^1$ , and their talent,  $\bar{Q}_{-1}$ , a government policy,  $\{\tau, \varsigma\}$ , and a sequence of prices for labor and capital  $\{w_t, R_t\}_0^\infty$ , a competitive equilibrium is a collection  $\{c_t(z_t^p; \cdot), b_t(z_t^p; \cdot), q_t^*, \hat{q}_t^p, \tau_t^u, G_t\}_0^\infty$  for  $p \in \{0, 1\}$  such that:

1.  $\{c_t(z_t^p; \cdot), b_t(z_t^p; \cdot), \hat{z}_t^p, \hat{q}_t\}_0^\infty$  solves the individual's problem for each  $p \in \{0, 1\}$  and for each  $t$ ;
2. all three markets, for goods, capital, and labor clear, i.e. equations (A-3)-(A-5) hold for all  $t$ ;
3.  $\{\tau_t^u\}_0^\infty$  is such that the unemployment insurance is self-financing, equation A-2 holds for all  $t$ ;
4.  $\{G_t\}_0^\infty$  is such that equation A-1 holds for all  $t$ .

## A.5 Discussion- Intergenerational Persistence of Occupations

How many entrepreneurs come from an entrepreneurial family background? Looking at West German data for 1970 and 1980, Arum and Müller [2004] find that 14.7% of all self-employed had a self-employed father. Lohmann and Luber [2004] report that between 1984 and 1988, 36% of West German males with a self-employment family background became self-employed. On the other end of the scale, Klein [2000] finds that only 39% of

all German family firms are in their founder generations, rising the likelihood of being an entrepreneur if one's parents were so to 61%. Similarly, Pistruì et al [2000] find that 60% of West German entrepreneurs have a parent who had been an entrepreneur. According to Mueller [2006] German employees whose parents have been self-employed are about 1.5 times as likely to start a business as others. Geißler [2006] differentiates between social mobility of entrepreneurs with more than 10 employees and those operating on smaller scales. He estimates that 50% of the former and 19% of the latter had parents who were entrepreneurs. Within the framework of the model, one can consider alternative interpretations of occupational inheritance. The most wealthy individuals who consume more and leave more bequests to their children are entrepreneurs and one can distinguish between three economic 'classes' in the model: the unemployed, the working class, and the entrepreneurial class. The question of 'how many entrepreneurs come from an entrepreneurial family background?' can thus be turned into a question of 1)class mobility and/or 2)wealth persistence and/or 3)earnings mobility. West Germany is generally found to be a society of relatively little class mobility. Erikson and Goldthorpe [1993] conclude that in West Germany "quite contrary to a [...] 'semi-classless' form of society and a 'land of fluidity' [...] historically formed influences on class-mobility chances have largely retained their power" (p.151) Müller and Pollak [2004] consider class mobility in West Germany and find that for the periods 1976-80, 1982-90, and 1991-99, 64%, 63%, and 63% of large employers, and higher and lower grade professionals with higher technical, administrative and managerial occupations remained within their class. Furthermore, the authors conclude that "we cannot find any major changes in (absolute) mobility experiences in the last quarter of the twentieth century." (pg.91) "Germany continues to have strong inheritance effects [...] as well as particularly marked distinctions between a manual and non-manual space of social mobility."(pg.110) "In sum [...] in Germany a large part of the effects of origin class on class destination is mediated through education. In particular the hierarchical component in class-mobility results from class inequalities in educational participation and education-based class allocation."(pg.106) This observation combined with recent data by the OECD [2007b] showing that "students from a blue-collar background are about one-half as likely to be in higher education as compared with what their proportion in the population would suggest."(pg.116) indicate little class mobility in West Germany. Comparing social mobility among European countries, Breen and Luijkx [2004] conclude that "Germany, France, Italy, and Ireland seem to be the least fluent countries [...] [in]-notably Germany- there is no statistically significant change[...] towards a weaker association between origins and destinations." (pg 73). Estimates of wealth persistence by Morck et al. [1998] show rather limited intergenerational mobility in West Germany, whereas Solon [2002] cites estimates of intergenerational earnings elasticity describing Germany as a country of relatively high earnings mobility. However, as Goldberger [1989] points out: "Naturally enough the sociologists' models incorporate outcomes other than income or earnings. Now suppose that intergenerational links are

stronger for occupation or socioeconomic status than for income or earnings. Then restricting attention to the monetary measures could lead an economist to understate the influence of family background on inequality.”(pg.513). Estimates on class mobility provide the most widely encompassing concept of the dependence of one’s status on family background. In the model class mobility and occupational mobility coincide and thus given that Pistrui et al [2000]’s and Müller and Pollak [2004]’s estimates are very similar I am confident using the former as a target for calibration.

## A.6 Tables

Table A1: Enterprises per 1000 labor force participants; employees

| Year | West Germany<br>(incl. firms with zero employment) | East Germany | Czech Republic | Poland | Hungary |
|------|--|--------------|----------------|--------|---------|
| 2002 | 68;75  | 60;67        | 174;187        | 89;111 | 136;145 |
| 2003 | 68;76  | 62;69        | 174;189        | 88;109 | 134;143 |
| 2004 | 73;82  | 70;78        | 147;190        | 87;108 | 137;146 |
| 2005 | 73;83  | 72;82        | 167;182        | 83;102 | 133;144 |
| 2006 | 74;83  | 72;82        | 167;180        | 87;101 | 129;139 |
| 2007 | 75;84  | 73;83        | 172;182        | 89;99  | 130;141 |

Data: Eurostat [2005] (NACE: C-I;K), Statistisches Bundesamt [2008] (for Germany)

Table A2: Additional Results

|                       | Benchmark | entrepreneurial<br>tradition<br>in East | independent<br>East<br>Germany |
|-----------------------|-----------|---|--------------------------------|
| Entrepreneurs in West | 0.0666    | 0.0637                                  | 0.0699                         |
| TFP growth West       | 0.0165    | 0.0160                                  | 0.0159                         |
| GDP per capita West   | 100.0000  | 98.4066                                 | 99.1013                        |
| Unemployment West     | 0.0546    | 0.0560                                  | 0.0551                         |
| Entrepreneurs         | 0.0671    | 0.0695                                  | 0.0667                         |
| TFP growth            | 0.0161    | 0.0155                                  | 0.0160                         |
| GDP                   | 100.0000  | 100.1299                                | 99.8792                        |
| Unemployment          | 0.0943    | 0.0786                                  | 0.0848                         |

: To maintain aggregate managerial knowhow at the benchmark level, I adjust  $\mu$  to 2.10071 for the first experiment. Note that in this case average innate intelligence is lower - leading to reduced TFP growth. Maintaining individuals’ decisions but using the distribution of innate intelligence from the benchmark model with  $\mu = 2.11$  leads to slightly higher TFP growth rates of 1.62% (West) and 1.57%.

Table A3: Additional Results: Decomposition

|                       | Independent<br>country | no<br>migration | no<br>subsidies | flexible<br>wages |
|-----------------------|------------------------|-----------------|-----------------|-------------------|
| Entrepreneurs in West | 0.0699                 | 0.0693          | 0.0685          | 0.0670            |
| TFP growth West       | 0.0159                 | 0.0158          | 0.0172          | 0.0162            |
| GDP per capita West   | 99.1013                | 97.2065         | 103.1110        | 99.2116           |
| Unemployment West     | 0.0551                 | 0.0551          | 0.0561          | 0.0545            |
| Entrepreneurs         | 0.0667                 | 0.0665          | 0.0662          | 0.0670            |
| TFP growth            | 0.0160                 | 0.0160          | 0.0159          | 0.0161            |
| GDP                   | 99.8792                | 99.6092         | 98.6967         | 100.5919          |
| Unemployment          | 0.0848                 | 0.0760          | 0.1566          | 0.0774            |

: For option (1) I adjust  $\mu$  to 2.10071 to maintain aggregate managerial knowhow at the benchmark level.