Three Stages of Czech Labor Market Transition:

Reallocation, Incentives and EU Standards

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Part I

Introduction

The functioning of labor markets affects both the macroeconomic success of countries and the success of individual workers, who search for jobs, earn wages, and acquire skills (through, e.g., schooling), all within the labor market. Labor markets are also among the key mechanisms of transition from central planning to market. In this volume, I present my recent work on three aspects of labor market functioning during transition in the Czech Republic: (i) reallocating workers and jobs from old post-communist firms to newly started private enterprises, (ii) providing incentives for human capital investment decisions, and (iii) coming to terms with new anti-discrimination labor-market legislation motivated by the looming EU accession. In each chapter, I provide not only a detailed study of the Czech case, but also a direct comparison to results for other relevant countries.

I note that the three issues studied in this book correspond to three stages of labor market transition. The first and most crucial role of labor markets was to support the vast reallocation of resources in early transition—to deal with the communist misallocation. Second, labor markets have taken on the responsibility of providing correct incentives for new allocation of resources. Third, the EU accession brings new challenges to labor market functioning along dimensions that previously received relatively little attention, such as discrimination.

To set the stage for the subsequent analysis, I start off in Chapter II with a brief exposition of labor-markets' importance for economic growth, with focus on issues faced by the post-communist transition economies.

Chapter III then studies early-transition mass reallocation of workers and jobs from pre-existing post-communist enterprises to newly starting private businesses. I find that small start-up firms are the engine of job creation in early transition and ask about differences in their growth across two different transition economies: Estonia, which experienced rapid destruction of pre-existing firms, and the Czech Republic, which reduced the old sector gradually. I find that the majority of job growth corresponds to within-industry reallocation. The within-industry growth of small start-up firms is similar in the two countries, in line with the convergence to western industry firm-size distributions. I also find similar patterns in the evolution of wage differentials between start-ups and old firms, and small differences in the extent of low-wage employment in start-ups across the two transition paths.

Next, I link these empirical findings to macro-economic theories of massive adjustment. In particular, I contrast the gradualist Czech and the rapid Estonian approach to the destruction of the communist economy to provide the evidence on selected macroeconomic theories of reallocation with frictions. The focus is on the optimal speed of transition theory (Aghion and Blanchard, 1994) and on the models of "creative-destruction" reallocation with incomplete contracting (Caballero and Hammour, 1996). I find that gradualism (slowing down job destruction) effectively synchronizes job creation and destruction. Drastic job destruction leads to little or no slowdown of job creation, in spite of the theoretical predictions. The overall conclusion is that small newly established firms are the underresearched fountainhead of jobs during the transition from communist to market oriented economies.

In Chapter IV, I turn attention to current resource allocation on the Czech labor market. I select the single most important issue for the coun-

try's growth potential and focus on the constrained provision of tertiary education. In particular, I ask whether the short supply of college education 'bites' on the labor market by leading to unusually high benefits to education.

Czech public colleges are highly oversubscribed. One interpretation of this fact is that the demand for education is "too" high because public colleges are tuition free. An alternative explanation is that the market reward to college degrees is very high. To differentiate between the two explanations, returns to education are estimated using 2002 data on hourly wages of salaried employees. The return to an additional year of schooling is close to 10% – that is relatively high given the level of economic development and average schooling level. (These returns are also somewhat higher than those estimated by Filer, Jurajda, and Plánovský (1999) on data from the mid 1990s.) Particularly large is the college/high-school wage gap: it is about 50% higher than in Germany or Austria, which have a relatively similar education structure. These findings are consistent with indeed very short supply of tertiary education provided by the funds-starved Czech public colleges.

Finally, in Chapter V, I investigate an issue relevant for the Czech Republic's accession to the EU, namely the effect of western-style anti-discrimination legislation. These policies are aimed at reducing the gender wage gap and their efficacy depends on the relative size of the gap's elements they target; therefore, it is important to quantify these parts. To this end, large matched employer-employee data sets from the Czech Republic and Slovakia are used to provide such a detailed gender wage gap decomposition. The results, based on 1998 data from medium and large firms, suggest that various forms of employment segregation are related to over one third of the overall pay difference between genders in both

countries. Outside of the public sector, however, almost two thirds of the total gap remains attributable to the individual's sex, suggesting much of the gap is due to violations of the equal pay policy.

Overall, I find that the Czech labor market has provided an efficient mechanism for initial-transformation reallocation of resources and that potentially insufficient early reallocation must be blamed on labor-demand-side or macro-economic policies. The wage setting process on the current labor market is fully free and capable of reflecting the state of demand and supply by skill. Here, the Czech wage differentiation indicates very short supply of tertiary education indeed. While the relative value of skills is higher than elsewhere, the extent of gender wage differences and the contribution of segregation towards the male/female wage gap appear quite similar to those found in Anglo-Saxon unregulated labor markets. However, there is a possibility of relatively large wage penalties for maternity stays or within-job discrimination of older women, which the data do not allow to either confirm or reject.

Part II

Labor Markets and Economic Growth

Labor markets are the mechanisms through which one of the most important economic resources - labor - is allocated, and where incentives are set for creation of human capital, which is one of the inputs of aggregate production functions. In this introduction, I survey arguments

on how labor markets are facilitating or constraining economic growth. There is much research on the role of human capital (HC) accumulation in macroeconomic growth theory. In contrast, the role of labor markets in affecting growth has not yet become a major topic of empirical analysis, except, perhaps, for the literature on labor market flexibility, which is, if only implicitly, related to growth. In this background exposition I briefly discuss key mechanisms by which labor markets can affect macroeconomic economic performance: the production of human capital and the allocation and reallocation of labor. After a general discussion of each topic, I dwell on the specific aspects relevant to transition economics.

1. Production of Human Capital

Human capital is the "engine" of workhorse growth models and lies at the heart of the revival of growth economics. There are two important causal links from HC to growth in the theory: First, in the neoclassical growth models, increases in HC cause growth as HC is one of the main inputs to the production. Second, Nelson and Phelps (1966) suggest that higher stock of HC makes technological innovations and therefore growth more likely. The first channel suggests that an increase in HC leads to a one-time increase in production, while the second implies that the effect of increasing HC on output is permanent.

There is only limited empirical evidence on the process that relates HC and growth. At the micro level, schooling increases productivity when included in en estimated production function (see, e.g., Griliches, 1997, for references) and schooling is a causal determinant of individual income (Card, 1999). However, the definition of HC used in growth theory covers not only schooling, but also accumulation of knowledge or abilities

to conceive and implement new ideas, labor-augmenting technology, and possibly even social capital. It is hard to measure these concepts and they do not differentiate the ability to apply knowledge in productive ways from technical progress. Still, the measure of HC used in macro empirical work is typically educational attainment, capturing only one form of knowledge. The existing empirical results based on educational attainment measures of HC are mixed. Recently, however, Topel (1999) and Krueger and Lindahl (2000) find macro returns to schooling in line with those estimated in the Mincerian wage regressions.

The introduction of new technologies (i.e., IT) then reinforces the importance of high-skill HC. For example, Acemoglu and Zilibotti (2001) argue that the low productivity in less developed economies is due to inadequate adoption of freely available technology, which in turn is caused by relative lack of skilled labor in developing countries.

Even though the quantity of human capital in transition is relatively high and the education systems were quite extensive under communism, there are many pressing problems related to the provision of human capital in the TEs. Perhaps not surprisingly, these problems are very different in the NIS and CEE (Newly Independent States and Central and Eastern Europe).

The most important policy issue in terms of human capital provision appears to be an increasing difficulty on part of both governments and individuals in some former Soviet-Union countries to maintain the level of education provided under the communist regime. Public expenditures on education have declined dramatically both in terms of real expenditure and share of GDP (UNICEF, 1998). Teachers' wages have declined and are often in arrears, especially in Russia and Central Asia. School buildings have fallen into disrepair and textbooks are often in short supply

(Mickelwright, 1999). Equally importantly, families in financial distress are less likely to incur both direct and indirect costs of educating their children. These costs have increased during transition while large fractions of the population face near poverty.

While equal access to education across demographic groups and regions was one of the proclaimed advantages of communism, the distribution of education degrees is consistent with the social stratification literature, with children of highly-educated white-collar parents being much more likely to obtain college education than children of blue-collar workers (Shavit and Blossfeld, 1993). Furthermore, learning achievements often vary with location as village and small-town children apparently learn much less than their city-educated schoolmates (Mickelwright, 1999). This pattern has to do in part with variation in the fiscal position of local governments, as much of education finance has been decentralized. Educational provision and access appeared to have suffered particularly severely in Central Asia and Caucasus, even though the reported statistics (of questionable quality) do not signal significant problems.

In contrast, the CEE countries are primarily in need of reforms that would improve the quality and skill composition of human capital. The educational system of the Central European countries places far too much emphasis on vocational training (see World Bank, 1996; and Spagat and Bertocci, 1998). Although the CEE workforce has a high average level of education, the majority of Polish and Czech secondary school students attend vocational and technical schools and only relatively small fractions of population receive general education, either secondary or tertiary. While there have been positive changes in the distribution of education in the recent years, the current educational structure is still far away from that of North America and Asia, where between 67 and 95 per cent of sec-

ondary school students follow general rather than vocational paths. The over emphasis on vocational education creates rigidities in the labor market. Students who commit themselves to a specific occupation at ages as young as 12 or 14 are not able to easily shift to radically different occupations as labor market conditions change. This problem will be a particular concern in Poland where an unusually large number of highly specific occupations are included in the vocational system (300 as opposed to 16 in Germany, see Laporte and Schweitzer, 1994).

In a dynamic labor market, where an individual can be expected to hold several different jobs over his or her lifetime, it is important that students learn how to learn rather than learn specific skills. This sort of learning is best provided in general academic high schools rather than in programs leading to a specific occupation. When numerous students have invested in credentials for a specific occupation, the temptation is for the government to respond to natural economic shifts against this occupation by trying to protect or revive the outdated occupational structure, rather than by promoting reallocation and dynamism. At the very least, the fact that workers think of themselves as having skills in particular, possibly outdated, occupations creates political pressure to invest in retraining programs at significant budgetary cost. If, however, workers have invested in the facility to acquire skills on their own through general schooling, they will be able to assume responsibility for learning new skills as required on their own as well.

Those who will truly do well in adapting to the dynamic labor market of the 21st century will be those with broad-based university education. A relatively low, although rapidly increasing, fraction of secondary school graduates complete university in CEE. Increasing the share of the workforce with tertiary education still further should be a goal of public policy.

Of course, given the need to cut taxes, this raises budgetary issues. Since education is an investment in students' future labor market success, it is entirely appropriate that they pay the costs involved. Tuition payments covering the bulk of tertiary education costs, combined with appropriate loan funds to enable repayment out of the future increased income resulting from attending university, should be introduced as rapidly as possible. Further, many of the European transition economies have started experimenting with private provision of schooling and these attempts should continue to be extended.

2. Allocation of Human Capital

The ability to allocate existing resources (i.e., labor, HC) across economic sectors, occupations, or regions is, at an intuitive level, crucial for static efficiency. Further, one can hypothesize that the weak explanatory power of HC for growth may be related to miss-allocation and therefore to the functioning of labor markets. The allocation function of labor markets would then be as important as the key theoretical role of HC in driving growth. The effect of misallocation is twofold: First, present-day efficiency of allocation is lower. Second, misallocation may lead to build-up of political economy obstacles to reallocation: pressure groups that benefited from misallocation rents will oppose efficiency-enhancing reforms and this opposition to reform may form a long-term obstacle to growth.

A strong effect on growth through allocation of resources probably comes through high labor taxation (see, e.g., Tabellini and Daveri, 1997, and the references therein). Labor taxation is important in many post-communist countries where the welfare state commitments inherited from the communist era misallocation of resources result in high statutory con-

tribution rates and excessive labor taxation.

A tightly related issue is the labor markets' ability of massive reallocation, i.e. the ability to successfully deal with extensive (initial) misallocation or with external shocks. It is crucial for transitional growth of countries off the steady-state path. Extensive reallocation of labor appears to be needed in the post-communist region as a result of communist misallocation. Large shocks occur often in less-developed countries and often appear to establish turning points differentiating between multiple growth equilibria. For example, the initial misallocation of labor on communist labor markets resulted in workers moving from over-stuffed heavy industries to services, finance and trade in the European transition economies. In contrast, Russia and parts of the former Soviet Union were not that successful and the initial transition often resulted in an increase in agricultural employment, reversing the process of economic development. This distinction is likely to drive long-term growth prospects.

Poor quality of market-clearing mechanisms (such as information channels used in hiring) will clearly negatively affect the allocation function of labor markets. Labor market segmentation (along, for example, ethnic dimensions) also negatively affects market clearing. However, it also alters schooling and HC accumulation: since students will expect their class status determine their labor-market careers, segmentation will also affect HC production. If innovative activity and social mobility play an important role in determining growth, policy should support equal schooling and innovations (entrepreneurs). The most important breakdown of market clearing comes from price wedges occurring through wage-setting distortions (minimum wage, centralized compressed wage structure, massive taxation and redistribution). Compressed wage distribution adversely affects HC accumulation in a stylized theoretical growth scenario: In the

Lucas-Uzawa framework, recently surveyed by Topel (1999), HC is accumulated endogenously, as a result of individual optimal investment decisions sacrifying present consumption for future returns. Incentives to invest in HC are related to rewards to such investments, which are carried by a flexible wage structure. In a market-driven scenario of (Kuznets) growth, exports propel the demand for industrial output, which in turn raises the demand for skilled labor and consequently the skill wage premium. This leads to investment in HC and consequently growth. This growth story requires, among other conditions, a flexible (regulation-free) wage structure and an elastic response of HC investment.

Free wage setting is as crucial to labor markets as the liberalization of prices is to product markets. Wages under central planning were determined according to industry and occupation-specific experience-related wage grids and had little to do with individual work effort. Unconstrained wage-setting mechanisms therefore provide incentives for hard work and educational investment that were entirely lacking in the communist era. The wage structure of transition economies (TEs) affects the type of resulting labor market equilibrium. Wage setting in the non-budgetary sector was quite unconstrained since the early years of transition. In many TEs, minor constraints on wage growth were kept through the mid 1990s. Following wage liberalization, the transition economies experienced a significant increase in wage dispersion. This was partly due to increasing returns to education as evidenced by numerous studies in the CEE region (for a survey, see Svejnar, 1999). This outcome is desirable as higher returns to education provide direct incentives for investment in education and should also provide motivation for tuition-based reform of tertiary education.

The upshot of this background Chapter for the subsequent analy sis is

threefold. First, unconstrained initial reallocation of resources is crucial for long-term growth. This issue is taken up empirically in the next Chapter. Second, more schooling is likely to increase economic growth and a very important type of schooling for technology adoption and innovation is tertiary education. Chapter IV deals with the issue of potentially short supply of tertiary education in the Czech Republic. Third, segmentation of the labor market is inefficient. In Chapter V I study the specific issue of gender segregation on the Czech labor market. As explained below, this last analysis is also of direct relevance for the looming EU accession.

Part III

Initial Reallocation: Comparing Two Paths

3. Introduction

"Transition" of the productive structure in the countries of Central and Eastern Europe (CEE) and the former Soviet Union is a process aimed at achieving efficiency through (1) restructuring of enterprises that were created during central planning (e.g., by privatization), and (2) reallocating capital and labor from these post-communist firms to new start-up private ones.[1] Much research within the transition literature has analyzed the process of privatization and whether it has resulted in efficiency-inducing restructuring (for surveys see Roland 2000, and Svejnar 1999, 2002). On the other hand, relatively little work has focused on newly created firms, even though early in transition at least one important author, Kornai (1990), viewed the rise of the new sector as more important for the success of transition than the restructuring of the old state-owned firms. While there is extensive research on the reallocation of labor across industrial branches (see Boeri and Terrell 2002, for a summary), as well as work focusing on patterns of private employment, for the most part this literature uses data that do not differentiate between privatized and *de novo* private firms. This is crucial to the extent that privatized firms did

[1] For a similar view on adjustment in developing countries see Caballero and Hammour (1996).

not effectively restructure, which is especially likely in the Czech Republic (see, e.g., Roland 2000). Furthermore, an empirical literature emerged recently that stresses the importance of the new start-up firms as the engine of growth in these economies (see, e.g., Berkowitz and DeJong 2003, and Mitra et al. 2001). Nevertheless, little remains known about the evolution and characteristics of this new sector.

In this Chapter, I address this gap in the empirical literature. First, I use unique worker-level data to characterize job creation in newly started enterprises during the early transition period in the Czech Republic. Second, I rely on similar data from Estonia to approximate the growth of the new sector in a country, whose policy path of transition has been very different from that of the Czech Republic.

The relative lack of research on new firms is likely caused by the fact that micro data sets on the early transition evolution of employment by the new/old firm distinction are scarce. My findings are based on labor market histories from retrospective household survey data. In the Czech data I directly distinguish between new and old jobs, while the Estonian data allow me to approximate this distinction. An important advantage is that the data are representative samples of the populations in both countries, and hence cover employment in all industries (not just manufacturing) and firm sizes.

As I show below, early transition in Estonia was characterized by massive job destruction of the post-communist firms in the absence of an effective social security net, while Czech reallocation proceeded at a more gradual pace, involved relatively generous social support, and featured extensive voluntary moves from the old firms to the new sector. Despite the different policy background, newly started and small firms

were an impressive sole engine of job creat on in both countries at the start of transition. In less than five years since the start of transition more jobs were provided by these firms than by the enterprises inherited (and potentially transformed) from communism.

The chapter is divided into two main section. First, I present the basic aggregate findings and interpret the aggregate Czech and Estonian job reallocation patterns in terms of macroeconomic theories in Section 6. Second, I focus on microeconomic aspects of the early-transition job growth in Section 7.

4. Background

4.1. Transition Policies

A decade after the start of transition, the Czech Republic and Estonia are two of the most market-oriented economies in the region. The Czech Republic became free of Soviet rule at the end of 1989 and undertook its first macroeconomic and institutional reforms in 1991, whereas Estonia gained independence from the Soviet Union in 1991 and enacted a reform package, similar to the Czech one, in 1992.[2]

Estonia experienced a deeper and longer recession than did the Czech Republic.[3] Whereas the unemployment rate in the Czech Republic peaked at 4.1 percent during the first year of the transition (1991) and then stabilized at around 3 percent for the following five years, the unemployment

[2] For more detail, see Dyba and Svejnar (1995) and Eamets (2000).

[3] The comparison of Estonia and the Czech Republic is essentially a comparison of the former Soviet Union with the CEE in all the above respects (except for the low level of the unemployment rate in the Czech Republic).

rate in Estonia followed an upward trend throughout the entire period, reaching almost 10 percent in 1996. The Estonians also faced far higher levels of inflation throughout the entire period, but especially in its year of price liberalization when the country suffered Ruble hyperinflation of 1,076 percent. The government responded to runaway inflation by aggressively implementing a tight monetary and fiscal policy and introducing a currency board for the newly established Estonian currency (crown) in July, 1992 (Eamets 2001). Finally, real wages declined more in Estonia than in the Czech Republic during the hyperinflation year, but followed a very similar pattern once the new Estonian currency was introduced.

The privatization process proceeded somewhat more rapidly in Estonia than in the Czech Republic (Kotrba and Svejnar 1994, Eamets and Philips 1998). There is extensive evidence on the Czech privatization experience that suggests little success in restructuring (see, e.g., the survey in Roland 2000). However, little information is available for either country on the experience of the new private sector and policies to promote start-up firms. For example, there are no official statistics on the amount of bank credit going to small new firms in either country, yet the national statistics do indicate that there was more overall credit available in the Czech Republic than in Estonia. My calculations indicate that total credit available as a percentage of GDP was about 66-69 percent in the Czech Republic (1991-94) whereas it was only 14-17 percent in Estonia (1994-95). More importantly, new credit was about 10-12 percent of GDP in the Czech Republic (1993-94) whereas it was only 2 percent in Estonia (1994-95). Survey evidence from Central European countries suggests that their credit markets have provided *de novo* private firms with large amounts of financing from the early stages of firm existence and that credit for newly established firms has been more available in

the Czech Republic than elsewhere (Bratkowski et al., 1999). I also know that the relative share of GDP allocated to active labor market policies, another source of financing for start-up firms, was lower in Estonia than in the Czech Republic (0.19 percent vs. 0.08 percent during the 1990s, see Riboud et al., 2001).

Finally, I note that in spite of the deeper recession in Estonia, its social safety net was substantially less generous than that of the Czech Republic. In the first year of transition, unemployed Czechs were offered 12 months of unemployment benefits entitlement and benefits as high as 90 percent of the previous wage. As the transition proceeded the Czechs tightened their unemployment benefit system, reducing the entitlement period to six months and lowering the replacement rate to between 50-60 percent of the previous wage. Whereas an Estonian unemployed worker also received benefits for six months, the replacement rate was only 7-10 percent. Finally, after six months of unemployment benefits, all low-income Czech households have always been entitled to welfare benefits indefinitely, whereas only the poor Estonian families with three or more children have been entitled to welfare assistance and for only up to three months.

4.2. Empirical Literature

The firm-based analysis of job creation and destruction in transition pointed out the dominant role of new firms in job creation and old firms in job destruction (e.g., Konings et al. 1996, Bilsen and Konings 1998,Johnson et al. 2000). However, this research had to rely on small samples of

firm survey data or was limited to the manufacturing sector.[4] The data scarcity is reflected in the few detailed analyses performed to-date about the growth of the *de novo* sector, its determinants and the impact of this sector on the economy.

The available evidence suggests that entrepreneurial activity is a critical source of growth in post-socialist countries. Berkowitz and DeJong (2003) find that the number of start-up firms across Russian regions exhibits a strong and enduring relationship with GDP growth rates. McMillan and Woodruff (2001) review studies of China, Poland, Russia and Vietnam and conclude that the robust economic growth enjoyed by Poland and China is attributable in large part to substantial entrepreneurial development they have enjoyed, while the economic stagnation Russia has endured during its transition is largely due to sluggish entrepreneurial development.

In this Chapter I use worker-level data to analyze job reallocation. Haltiwanger and Vodopivec (1999) use the same data I use to provide an extensive analysis of Estonian job creation and destruction in the public and private sectors, where the latter combines jobs in the privatized sector with those in *de novo* firms. They show a rapid increase in both worker and job reallocation during the early 1990s so that the annual worker reallocation rate exceeded 35 percent by 1993. The present analysis differs in that I use a different categorization of Estonian jobs in order to approximate the extent of start-up employment (new sector).

Finally, since I also examine wage differentials between old and new sector jobs in this Chapter, I point out that there is a small literature

[4] There are representative studies of self-employment, however. See for example, Earle and Sakova (2000).

that focuses on wage gains of individuals who change jobs in transition economies.[5] This research sheds light on the nature of job reallocation to the extent that wage gains reflect productivity gains. Munich et al. (2002a) use the same Czech data that I use to examine wage gains associated with the emerging new private sector, taking into account the decision of workers to quit or stay and to move to firms in the new versus old sector of the economy. Their findings suggest that those who quit an old-sector job for a new-sector one had the highest wage gains, and those who were laid off and went to another old sector had the lowest gains. Lehmann et al. (2002) study the extent and consequences of worker displacement in Estonia using the same data I use. They find little difference in the wage evolution of displaced workers compared to that of workers who stayed employed. The main cost of job displacement is apparently associated with the risk of long-term non-employment.

5. Data and Measurement Issues

Measuring the dynamics of worker and job reallocation into the *de novo* private sector at the beginning of the transition from communism to capitalism is not easy. First, most of the start-ups are small firms and in the early part of transition the statistical offices did not include firms with fewer than 20 workers in their firm surveys. The offices were also unable to locate many of the newly established firms with more than 20 employees. Second, household labor force surveys started to be implemented in these countries only in the mid-1990s, leaving the first crucial years of transition undocumented. Third, most of the existing household survey

[5] See, e.g., Boeri and Flinn (1997), Burda and Mertens (1998), Hunt (1998), Munich et al. (2001), Noorkôiv, et al. (1998) and Sabirianova (2000).

data does not differentiate between new private and privatized firms and few samples cover information on the size of the employer.

Hence, the only way to gather representative information on the entire population of firms during the early period of transition is to collect retrospective data from households, asking individuals about employer attributes.[6] In this section I briefly describe these data and show how measures of job reallocation, which are complementary to those based on firm-level data, can be constructed with individual data.[7]

5.1. Data

The analysis uses data from two similar retrospective surveys. The Czech survey was administered in December 1996 to 3,157 randomly selected households throughout the Czech Republic using the sample frame of the official Labor Force Survey. I have the employment histories of 4,786 individuals, who experience 7,926 main jobs during the 1991-1996 period. The Estonian survey was administered in the first quarter of 1995 to one percent of the population between the ages of 16 and 75 in 1995 using the Census for the sampling frame. In Estonia, I have usable data on 7,928 individuals who experience 14,465 main jobs during 1989-1995. The number of jobs per person in the data is therefore quite low at 1.82 in

[6] One could also collect firm-level surveys today with retrospective questions about employment, but such sampling would not cover new firms started in early transition that went out of business, which would lead to underestimating the size of the new sector.

[7] I refer the reader to Jurajda and Terrell (2001) for a detailed description of these measures.

Estonia and 1.65 in the Czech Republic.[8]

For each job there is information on the industry of employment, type of employment and a number of employer attributes. For those that exited their employment, I also observe the reason for separation. Whereas in both countries there is information on the respondent's wage at the beginning and end of each job, in Estonia respondents were also asked to report their earnings in October of each year. However, a drawback of the Estonian data is that the wage information from the hyperinflation years of 1990-1991 is not usable.[9]

The classification of firms into the new and old sectors is a crucial aspect of the analysis. First of all, I set aside jobs in the public sector (education, health, and public administration). Next, I want to contrast the evolution of the newly created firms to that of the pre-existing old firms. The Czech data is unique in that it provides this distinction.[10] Therefore,

[8] Retrospective data is often criticized for "recall bias." Yet, research indicates that individuals recall traumatic events more readily and I believe that changes in the labor market status (rare at 1.7 to 1.8 jobs per person during six years) are likely to have been particularly memorable in an economy transiting from a system with many years of steady employment. For Estonia, Noorkoiv et al. (1997) compared the responses on economic activity in 1989 in the 1995 survey with the responses in the 1989 census and found that "the recall data corresponded quite well. The majority of the discrepancies are attributable to changes in labor force definitions."

[9] To form complete monthly labor market histories, I interpolate wages from the available information.

[10] Respondents are asked about the ownership type of their employer at the end of their employment spell. The choices are, e.g., "newly established private firm," "firm after privatization," "firm in privatization." This is not a perfect measure of ownership. In particular, it is unclear how respondents consider spin-offs from privatized or state-owned firms. However, the number of workers employed in spun-off enterprises is

I pool state and privatized jobs into the old sector and distinguish the *de novo* private enterprises (new sector) from the privatized firms. In the Estonian questionnaire, however, firm ownership is categorized as state, private, or cooperative/collective. I can distinguish whether a given job is in the new or old sector for employment spells that started before 1992, the year of privatization. If a worker reports being employed in a private firm before privatization began in Estonia, the firm is likely to be newly started. It is clear that employment spells starting in state-owned firms belong to the old sector and that I should keep ongoing jobs in firms that are privatized in the old sector. However, for employment spells starting in private firms after 1992, the data do not distinguish jobs in *de novo* private firms from those starting in privatized enterprises.

In Section 6, I categorize all such spells as being in the new sector, assuming, based on the Czech results that job creation in old firms is minimal. In Section 7, I asses the sensitivity of the analysis to this strong assumption by categorizing these undetermined Estonian spells as being in the new sector old sector depending on the size of the firm in which hiring occurs. The latter approach is guided by the Czech evidence on startup size composition, which indicates that 90 percent of all new-firm employment is in firms of less than 100 employees. Therefore, in Section 7 I categorize Estonian employment spells starting in small firms as being in the new sector and assign those employment spells starting in large firms to the old sector. This is the best approximation available, although there are two, potentially offsetting sources of measurement error: (i) some of

unlikely to be large in the Czech Republic. Lízal et al. (2001) analyze the process of breakup of old firms in Czech manufacturing and suggest that employment in spin-offs amounts to approximately 5 percent of all employment.

the large private firms that hire workers in Estonia may be newly created private firms, and (ii) some of the hiring in small private firms occurs in privatized firms. Following this strategy, the observed growth of the new sector is not due to reclassification of ongoing jobs.

In the end, I therefore distinguish between three main employment sectors: the *old sector* (comprised of jobs in the state-owned enterprises, cooperatives, and privatized firms), the *new sector* (including all jobs in *de novo* private firms and the self-employed as well as jobs of new hires into Estonian privatized firms), and the *public sector* (public administration, health and education).

The coding choices maximize comparability across the two countries given the structure of the data and allow me to focus on the under-researched phenomenon of startup employment growth. An alternative approach would be to rely on the private/state coding and to reclassify jobs in privatized firms as new (private) at the moment of privatization. Haltiwanger and Vodopivec (1999) use such coding for their analysis of the Estonian data. I am not able to compare the two transition paths using the private/state distinction because the Czech data do not provide the timing of privatization and I cannot reclassify ongoing jobs from state to private status accurately. I do, however, examine employment in firms of more or less than 100 employees (large vs. small), irrespective of ownership, which is strictly comparable in Estonia and the Czech Republic. This evidence is presented in Section 7. Such cross-country comparison is free of measurement error and speaks about changes in firm-size distribution across different transition paths. As I argue below, the growth of the new sector appears closely linked to the firm-size structure of transition economies.

5.2. Measurement of Job and Worker Reallocation Rates

Although job destruction and job creation are traditionally measured with firm data, they can also be measured from worker flow data using information on the type of employment separation.[11] In the Czech (Estonian) questionnaire, I have 13 (21) answers for how someone separated from their job. I define job destruction (JD) as any separations where: 1) the firm was closed down (by the respondent or another employer) and 2) the separation was part of a mass layoff.[12] The JD rate is the total number of job destructions at a given time *t*, divided by the number of jobs in *t-1*. Clearly some separations not included in these two types (e.g., retirement or quit without replacement) also correspond to job destruction; hence, my JD measure is likely to be a lower bound estimate.

To measure job creation (JC), I follow the existing literature and use the simple identity that net employment growth is the difference between job creation and job destruction. This implies that $JC_{tk} = \Delta E_{tk} + JD_{tk}$, where ΔE_{tk} denotes the time change in employment in sector k (i.e., new or old), and where JC_{tk} and JD_{tk} are job creation and job destruction counts in sector k in time t respectively.[13] Again, this may be considered

[11] See Davis and Haltiwanger (2000, pp. 2716-7) for the standard definitions of job creation and job destruction using firm-level data. See Blanchard and Diamond (1990) for the development of comparable measures using worker-level data.

[12] In addition to exits due to business closures, workers indicated if they exited a job due to a "reduction in workforce" in the Czech Republic or as part of a "reorganization, privatization or bankruptcy of the enterprise" or "personnel reduction" in Estonia. See appendix tables in Jurajda and Terrell (2001) for more detail.

[13] This strategy of estimating job creation and job destruction rates relies on random sampling. When I observe a layoff with replacement within a given employment category, it is expected to be compensated by hiring another worker within my sample into

as a lower bound estimate for JC because JD may be underestimated. In particular, when the estimated JC_{tk} measure is negative, it informs me that the minimum number of quits not replaced is -JC_{tk}. Hence, whenever the initial JC_{tk} estimate based on layoffs without replacement is negative I add the negative of JC_{tk} to my JD_{tk} measure and set JC_{tk} at zero.[14]

My measure produces the same net job creation as that based on firm data but it results in a measure of gross job flows that is not identical to that of the firm-level studies. Nevertheless, my worker-level data offer important advantages. In particular, unlike data sets used in the empirical literature on job creation and destruction in transition, my data are based on well-defined random sampling, cover all economic activities and all firm sizes in the economy, and provide a continuous coverage of transition. Many studies on transition countries use small unrepresentative samples of firms or focus on one industry only. Furthermore, these data often suffer from "survival bias" as the firm samples are typically collected only during mid-transition and therefore include only surviving firms.[15]

Perhaps most important is the fact that the firm-level approach is not available for medium and large firms during the early years of transition

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this employment category. Layoffs with replacement constitute only about 2 percent (3-6.7 percent) of all Czech (Estonian) separations.

[14] In my final empirical work, I perform this correction at a more detailed level, checking for $JC_{tks}<0$ where s denotes one-digit industry and summing up the corrected JD_{tks} across industries within employment sectors k to obtain my final estimate of JD_{tk}. This additional level of detail changes the corrected JD measure only in the old sector, which comes as no surprise.

[15] Survival bias can lead to the underestimation of job destruction rates. It may not only affect state-owned enterprises, but can come from the closure of newly established private businesses during (chaotic) early transition.

when Czech unemployment diverged from the rest of the CEE countries, and little firm-level information exists for small firms in all years. Thus relying on firm data alone would ignore potentially important evidence that one can find using my approach. My data also allow me to simultaneously consider worker and job flows, and my measure of job reallocation captures within-firm restructuring, which is not discernible with firm-level data. Firm-level data contain only the changes in total firm (plant) employment. If firms in a given sector maintain constant employment, but lay off and hire an equal number of workers (into different positions), such restructuring would be ignored in a firm-level data set, but is captured in my data.

6. Aggregate Reallocation and Theories of Massive Adjustment

Less-developed countries frequently experience massive shocks that require major adjustments in their economies and also appear to establish turning points, differentiating between multiple growth equilibria (Pritchett, 2000). What is significant about these restructuring episodes is extensive labor movement (across industries as well as within), restructuring or closing of firms in low-productivity sectors, and the creation of firms in high-productivity sectors. Among the causes of such adjustment episodes are brisk trade liberalizations, external shocks, e.g. oil, and recently, the collapse of totalitarian central-planning regimes.[16]

[16] To give examples consider (i) the abandoning of import substitution policies and the adoption of trade liberalization and other market oriented policies (including considerable privatization) in South Asia in the 1970s and in Latin America in the 1980s, (ii) the oil shocks to the Middle East or Latin America, and (iii) the collapse of the

Reallocation frictions can thwart or even disable the transition process so that the times of adjustment are often times of employment crises. When it is clear which sectors need to be scrapped and which ones need to be built-up, governments can take an active role in affecting the speed of both processes. There are two main classes of economic models that deal with this policy issue of (supply-side) adjustment of the productive structure. Importantly, they differ in their policy prescription.

First, a strand of models that I refer to as the Optimal Speed of Transition (OST) theory, emulates the post-soviet economies and studies the reallocation of labor from the inefficient old state sector to the newly established private sector (e.g., Aghion and Blanchard, 1994; Castanheira and Roland, 2000).[17] Note, however, that these models can also be applied to economies in the developing world, where a major economic sector is inefficient and bloated.[18] The shared essence of the various OST models are macroeconomic mechanisms which make the pace of job creation in the efficient sector depend on the speed of job destruction in the inefficient sector. The outcome is that both too much and too little destruction slows down creation; the literature advocates a gradual phasing out of the inefficient sector as optimal for maximizing the speed of job creation and hence reallocation.

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soviet rule in Europe and Central Asia in the early 1990s. Note that in the post-soviet countries the period of adjustment, coined as "transition," is characterized by the simultaneous adjustments in both economic and political institutions.

[17] Other examples include Burda (1993), Katz and Owen (1993), Chadha and Coricelli (1994), Atkeson and Kehoe (1996), Rugerone (1996), Brixiova (1997), and Boeri (1999). For a survey, see Roland (2000).

[18] Such as the oil-revenue-dependent public sector in the Middle East. See, e.g., Pissarides (2000).

Second, there is a large body of theoretical research, building on the notion of "creative destruction," that explains job flows in developed economies as stemming from a continuous stream of allocative shocks (e.g., Aghion and Howitt, 1992; Caballero and Hammour, 1994). Within this literature, Caballero and Hammour (1996a) develop a model of the reallocation process during massive structural adjustments in less developed economies. Their two-sector model based on the embodiment of technology in capital explores the effects on reallocation of incomplete contracting in labor and capital markets. Contracting frictions in their model account for the adjustment crises of less-developed countries — the periods of dramatic destruction of productive capacities, insufficient job creation and high unemployment. The upshot of their analysis is that governments should not only actively slow down the destruction process (similar to the OST prescription) but also boost job creation to attain efficient reallocation.

Hence, the distinction between the two theoretical literatures is important for evaluating *gradualism,* traditionally defined as slowing down the scrapping of the inefficient sector, as an effective way of avoiding high unemployment during a major change in the economic environment. As Caballero and Hammour (1996a) note: "*The real test is whether gradualism can close the wedge between creation and destruction to help redress the transitional employment problem."*

Unfortunately, very little empirical evidence is available on job reallocation in economies undergoing major structural reallocation to substantiate the extensive theoretical literature.[19] This is in contrast to the vast

[19] Davis and Haltiwanger (1998) survey the little evidence available on job reallocation in developing countries. The limited literature from transition economies is

research documenting job reallocation (and its cyclicality) in the U.S. where empirical stylized facts are available for motivating and evaluating business cycle theories (e.g., Davis, Haltiwanger, and Schuh, 1996). Analysis of economy-wide job flows in periods of radical adjustment is needed to develop and refine theories of structural reallocation. Here, the experience of transition economies provides a fruitful opportunity because it represents an unusually extensive experiment of restructuring. First, there are countries experiencing a similar reallocation process under different policies. Second, drastic job reallocation is not constrained to a particular industry, e.g. steel, or region, but is truly economy-wide, offering a striking case for the evaluation of macro models of aggregate reallocation mechanisms. Third, comprehensive micro data on job and/or worker flows are available in many of these countries.

In this Section I therefore use uniquely comparable micro data to produce consistent macro information on the dynamics of economy-wide job reallocation during the dramatic adjustment period following the collapse of communism in two countries – Estonia and the Czech Republic – operating under markedly different economic policies. While the Czech approach to destruction of the communist economy was gradual, Estonia's early transition was characterized by extensive scrapping of old state firms. This difference occurred on a similar background of rapid price and foreign-trade liberalization.

The reallocation theory cited above provides an anchor for my empirical analysis. I describe the patterns of job reallocation in both countries, ask about the usefulness of the two strands of models for understand-

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discussed in Section 2.2. See Offer (1999) for a discussion of similarities and differences between "development" and "transition".

ing the observed reallocation patterns, and discuss the optimality of the observed policy conditional on the validity of each theory and its assumptions.[20]

6.1. Theoretical Predictions

6.1.1. Creative Destruction with Frictions

A large class of models, which build on the notion of "creative destruction," explain the patterns in the U.S. job creation (JC) and job destruction (JD) as stemming from a continuous stream of allocative idiosyncratic shocks related to technology improvements and changing competition. Within this literature, Caballero and Hammour (CH) (1996b) study the implications of contracting difficulties in the formation of production units on the cyclicality and efficiency of job flows. Their analysis is motivated by the problem of "appropriability" arising when joint investments of employers and employees can be appropriated by one of the contracting parties or governments. They argue that the opportunity costs of creating unemployment are lowest during recessions and it is therefore efficient to concentrate job reallocation and unemployment near the trough of a recession. As an efficient economy enters a recession, JD increases first, closely followed by a rise in JC. As the economy is pulling out of the recession, JC and JD fall, again synchronously. Contracting inefficiencies can, however, "decouple" JD and JC and result in an inefficient realloca-

[20] Studying only two countries prevents us from using a cross-country regression framework, but does allow for an informative analysis of reallocation patterns. Recently, Topel (1999) stressed that a fruitful way to learn about and to test macroeconomic theory is to conduct "detailed empirical studies of the operation of labor markets and the impact of policies and institutions within individual countries."

tion, where more unemployment is created with less reallocation. These two patterns are represented in the upper two graphs of Figure 6.1. The integral between JD and JC where JD > JC (JD < JC) represents the amount of accumulated (decumulated) unemployment.

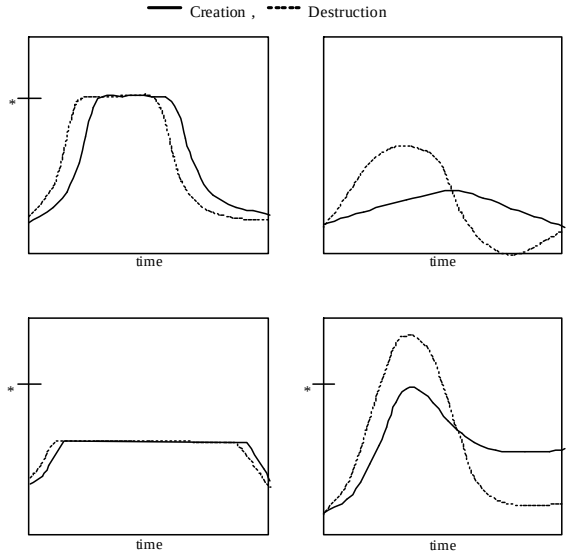

Figure 6.1: Job Reallocation in OST and CH Theory.

A similar reasoning about the importance of frictions for reallocation can be applied to the dramatic adjustment episodes of less-developed and post-soviet countries. Indeed, CH (1996a) study the implications of contracting inefficiencies for such adjustment periods in a two-sector reallocation model. Here again, efficient structural reallocation is characterized by a tightly synchronized evolution of JC and JD to avoid the waste of resources and political economy problems through excessive unemploy-

ment. Unfortunately, restructuring is thwarted by the high cost of job creation brought about by transactional difficulties. This core feature of their model leads them to reject gradualism, traditionally defined as government support for the collapsing economic sector, as a sufficient optimal policy. They argue that gradualism alone does not effectively synchronize creation and destruction. Instead, they advocate a policy consisting of a combination of "vigorous creation incentives" in the expanding sector and a gradual phasing out of the inefficient production units.

6.1.2. Optimal Speed of Transition

The policy implication of CH (1996a) is in contrast to that of a strand of models on transition to a market economy – the Optimal Speed of Transition (OST) theory – that supports the traditional notion of gradualism. It studies the intensive transitional off-steady-state growth through more efficient use of existing resources. These models emulate the post-soviet economies by focusing on the reallocation of labor (and capital) from the old, less efficient state sector to the new, more efficient private sector. The shared essence of the various OST models is that the pace of job destruction (layoffs) in the inefficient old sector affects the speed of job creation (hiring) in the new sector. However, the economic mechanisms that relate the speed of JC to the speed of JD vary across these models.[21]

[21] Both the OST theory and the CH 1996a model take the view of a two-sector economy moving to a one-sector economy, which is similar to both the traditional economic development models concerned with moving from a dual sector (modern and traditional) economy to a single modern sector (first developed by Lewis, 1955) and the more recent trade liberalization literature, where the dichotomy is between the import-competing and export-oriented sectors (see, e.g., Edwards and van Wijnbergen, 1989, for a review). In what follows I do not consider trade liberalization, which has been

The backbone of the OST literature is the paper by Aghion and Blanchard (1994) where, similar to the CH models, reallocation frictions occur in the labor market. While the CH model assumes transaction difficulties, Aghion and Blanchard assume an efficiency wage setting mechanism where high levels of unemployment lower wages. In their model, market forces determine increases in employment in the new private sector; hence, if the cost of labor is high because of high wages and/or taxes, fewer workers are demanded. On the other hand, the government engineers the downsizing of the state sector through the reduction of subsidies (push) and the creation of generous unemployment benefits (pull). The government must select the rate at which it will reduce the old sector knowing that if it goes too slowly, there will be a low unemployment rate, which will put upward pressure on wages and hence slow down the growth of the new efficient sector. On the other hand, if it downsizes the old sector too rapidly, it will create high unemployment, which will reduce net wage increases. However, as the model suggests, an excess rate of closure tends to reduce the expansion of the tax base, out of which unemployment benefits are assumed to be financed. The government will then have to raise taxes in order to finance unemployment (and welfare) benefits, hence total wage costs increase, dampening the demand for labor in the private sector. Similarly, if workers leave the labor force instead of becoming unemployed, pensions and other social benefits are also government financed.

Hence, the model postulates an inverted "U" relationship between the speed of job creation in the new sector and the level of unemployment. The dynamics of the economy depend on the initial unemployment level,

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extensively analyzed.

which determines the level of wages and hence private job creation, and on the speed of labor shedding from the old sector. See Figure 6.2 for an illustration: Suppose that the economy starts from a low level of unemployment U_0, which determines the initial level of job creation in the new productive sector to be $JCnew_0$. Suppose further that initially the government sets job destruction in the old inefficient sector to be $JDold_0$. The gap between $JDold_0$ and $JDnew_0$ (denoted as x in the graph) leads to an equal increase in unemployment (from U_0 to U_1) which again leads to a rise of JCnew for the next period. As long as the government continues to set JDold above JCnew, unemployment rises, up to a point where the unemployment rate then feeds back into the system, slowing down the speed of job creation in the new sector. As long as the government does not set JDold too high, the economy converges to a stable level of unemployment at which the rate of job destruction in the old sector equals the rate of job creation in the new sector. Unemployment remains at this equilibrium level until the transition is over and the inefficient sector disappears.[22] Furthermore, if the government raises the job destruction rate up to JDold* this will maximize job creation and the speed of transition.

Three of the graphs in Figure 6.1 plot the evolution of JCnew and JDold predicted from Figure 6.2 under three scenarios, which all share the assumption of a low initial level of unemployment and all involve the same total amount of j ob creation, but achieved in different time span and at differential unemployment. The upper left graph follows job reallocation in the story I gave immediately above—where the government

[22] In Aghion and Blanchard (1994) the inefficient sector can also be restructured and stay in operation.

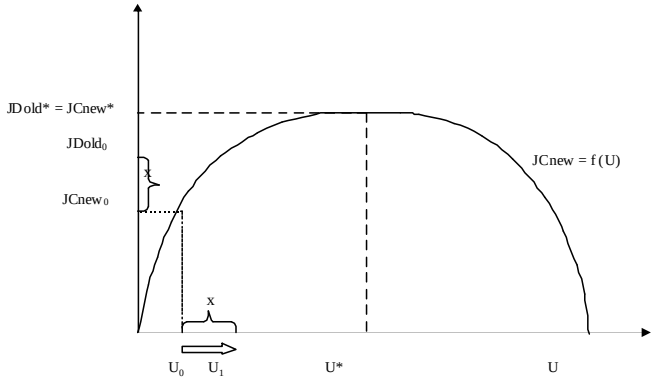

Figure 6.2: Unemployment and Job Reallocation in OST Theory.

gradually increases JDold up to JDold*.[23] Here, gradualism synchronizes JC and JD. The pattern is the same for the CH model, when there are no contracting frictions. The bottom left panel illustrates the too-slow-JDold scenario, where JCnew catches up with JDold, but reallocation (transition) proceeds at a slower pace – below the optimal (*) level – and hence takes longer to complete. Finally, the bottom right panel plots the evolution of my hypothetical economy where the government raises JDold above the maximum JCnew* level. This leads to a sharp slowdown of JCnew and an increase in unemployment (the area between JDold and JCnew). In plotting this scenario, I further assume that the government responds to such a rise in unemployment by quickly slowing down JDold. Again, reallocation takes too long and is too painful in terms of unem-

[23] Here I assume that the optimal reallocation rate is such that all reallocation occurs in a short period.

ployment.

The OST literature is extensive (see, e.g., Boeri, 2000, and Roland, 2000, for a review) and includes models that establish JD?JC links using different channels and even in the absence of reallocation micro frictions. To mention but one important paper, Castanheira and Roland (2000) develop a dynamic general equilibrium model of endogenous capital accumulation where again the effect of an excessive speed of closure slows down the growth of the new sector. However, their feedback mechanism works via the depression of savings (investment) when the unemployment rate is high. In their model, for an overly slow speed of closures to have negative effects, it is necessary to assume that state-owned enterprises have soft budget constraints (so that wage payments can exceed the marginal product of labor). As long as wages in the old sector are kept low, old-sector firms will see their workers leaving for the new sector (quitting) even if the rate of scrapping of the old sector (layoffs) is too low.

6.1.3. Existing Evidence

The OST and CH theories focusing on adjustment in transition or less-developed countries were developed in the absence of well-grounded stylized facts about the reallocation of jobs. In transition research, both the empirical and theoretical work was being undertaken simultaneously; there is now a substantial literature on job and worker reallocation in transition. Most of this research, however, is descriptive and none examines its findings in the light of reallocation theory. This work is surveyed in Section 4.2. Hence, in spite of all the existing empirical work, little is known about the total extent and dynamics of job reallocation from the old state to the newly established private sector. While official statistics

exist on private employment, they combine jobs in *de novo* firms with those in privatized companies. This is potentially problematic given that the literature on performance and restructuring of privatized firms often suggests disappointing results (e.g., Roland, 2000). Consequently, the existing direct empirical evidence on the OST models is sketchy and does not go, for the most part, beyond discussing macroeconomic aggregates.[24]

6.2. Basic Findings

The reallocation theories described above provide an anchor for my analysis in that I first empirically describe the objects of this literature: job creation, job destruction and the amount, speed and efficiency of worker reallocation. I then use these results to ask about the usefulness of the theoretical models for understanding the observed reallocation patterns and to discuss the optimality of the observed policy, conditional on the validity of each theory and its assumptions.

The first major empirical endeavor is to establish the extent of reallocation from the old to the new sector during the Czech and Estonian transitions. Figure 6.3 shows the number of workers in each of the two main ownership sectors – old (state, privatized, and coops) and new (private firms and self-employed entrepreneurs) in the first month of each quarter of each year since the start of transition, which is 1991 for the Czech Republic and 1992 for Estonia.[25] These are the first results avail-

[24] For example, Aghion and Blanchard (1994) compare the total change in state and private employment between 1989 and 1992 with 1992 unemployment rates in five transition economies. They also compare the average exit rate out of unemployment. They interpret this evidence as broadly consistent with their model.

[25] The time period covered is 1991 to 1996 for the Czech Republic and 1989 to

able for these two countries on the evolution of the structure of jobs in the old and the new sector from the early part of the transition.

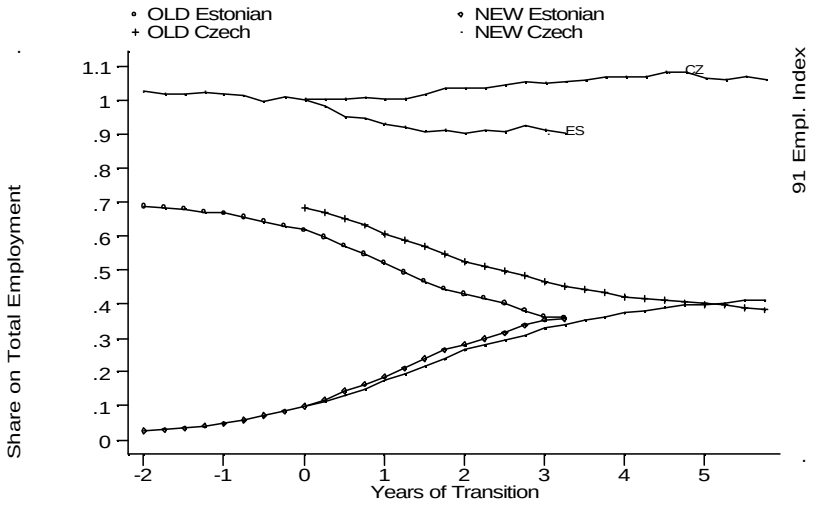

Figure 6.3: Employment Evolution by Sector.

The story told by this figure is most extraordinary: within five years of the "big bang" of economic reforms in the Czech Republic, and within three years for Estonia, more workers were employed in the new sector than in the old in each country. This massive reallocation is not a consequence of reclassification as privatized firms remain in the old sector. Within a few years, the newly established firms provide more jobs than

1995 for Estonia. I do not present the results for the public sector since this is not highlighted in the theory. Moreover the public sector holds on to a stable workforce in both countries.

the firms that still remained from the communist economy.[26] Moreover, in the Czech Republic, the reallocation is apparently not propped by large flows out of the workforce (or labor force). I note that total Czech employment (corrected for population growth) exhibits slow growth over the entire sample period. In contrast, the more rapid Estonian reallocation is characterized by a pronounced decline in total employment.[27]

This result is important for interpreting the "Czech unemployment puzzle." The Czech unemployment rate stabilized between 3 and 4 percent during transition in presence of significant unemployment inflows. This was the exception to the rule of quickly emerging double-digit un-

[26] With the exception of new hires into privatized Estonian firms. On the other hand, I may be underestimating the extent of restructuring in Estonia as its privatized firms are probably restructuring more than Czech privatized enterprises.

[27] To distinguish between unemployment and out-of-labor-force may be hard in early transition as the artificial notion of communist full labor-force participation fades in importance. Hence, I juxtapose sectoral reallocation with employment dynamics, rather than with unemployment. The employment growth index is corrected for growth of population aged 15 to 65, which rose from 0.5% in 1991 to 3% in 1996 in the Czech Republic and was negligible in Estonia. Nevertheless, substantial employment growth remains, which may appear suspicious given the common wisdom of large employment losses during early transition. However, as argued earlier, official statistics relying on firm reporting are likely to miss employment in small newly established firms. Indeed, the employment growth rates based on the Czech Labor Force Survey, which was first collected in 1993, are consistent with our statistics. Similarly, I can match the employment decline of early transition reported in the firm census when I ignore employment in small firms. Finally, I note that the decline of Estonian employment in Figure 3 does not include the outflow of native Russians, mainly military personnel, during early transition (Eamets, 2001).

employment rates in other transition economies.[28] One interpretation of the low Czech unemployment is that it was a result of slow restructuring and worker churning within the old sector. Using the new/old distinction to measure reallocation, Figure 3 suggests that low unemployment occurred simultaneously with extensive reallocation.[29] Even though the fundamental need for reallocation may differ across the two countries, it is remarkable that the degree of reallocation is the same - albeit occurring in a different time span - and that it occurs at much lower employment costs in the Czech economy.

Next, it is natural to ask how job reallocation differs by sector. Is there simultaneous job creation and destruction in the declining old sector or in the growing new economy? In Figure 6.4 I plot the rates of job creation and destruction in each sector over time; the upper two graphs present the

[28] The puzzle has been examined from a number of angles (see, e.g., Boeri and Burda, 1996; Ham, Svejnar and Terrell, 1998). However, this literature has not been fully successful in identifying the main cause for the dramatic divergence between the unemployment rates of the Czech Republic and those of the Central and East European transition economies during 1991 and 1992. This is likely due to the severe paucity of comprehensive micro-level data covering the first years of transition.

[29] Aghion and Blanchard (1994) conjecture that the low Czech unemployment rate is a result of large outflows from the labor force and unrecorded private activities. However, in unreported calculations using my data I find that inflows into long-term non-employment have been steady throughout the transition, making labor-force outflow an unlikely culprit for the stabilization of Czech unemployment below 4 percent since 1992. The shadow-economy hypothesis does not appear to be the driving force either according to Johnson, Kaufmann, and Shleifer (1997) who provide estimates of the unrecorded activity based on electricity-consumption. Their estimates imply that the Czech economy consistently ranked among the Central European countries with the lowest share of the shadow economy on GDP.

share of job reallocation on total economy-wide employment and the lower two graphs present the shares on employment in the relevant sector.[30] A striking result emerges. Using the new/old distinction allows me to completely separate all job creation from job destruction during early transition. Old firms are hiring only to replace a fraction of separating workers, as job creation in the old sector is very low. Similarly low is job destruction in the new sector with the exception of the Estonian new sector in 1994-95.

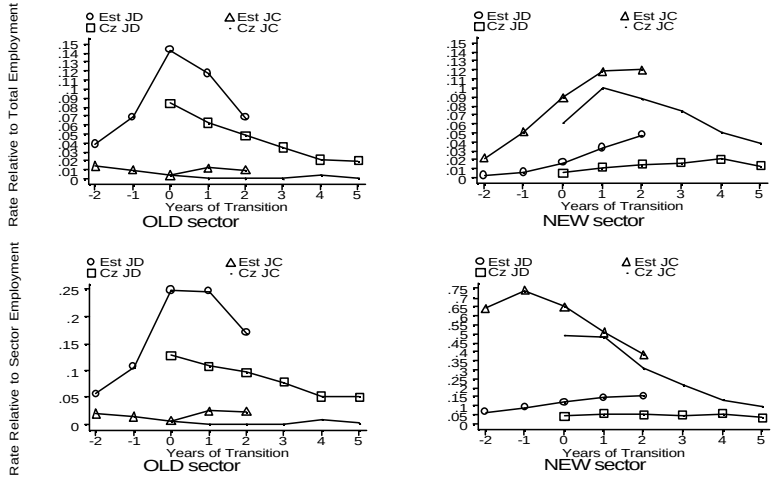

Figure 6.4: Job Reallocation by Sector.

Figure 6.4 also suggests that the two countries followed a very different

[30] While the lower graphs make the reported job reallocation rates comparable to the traditional measurements, the upper graphs give a more appropriate description of the adjustment/transition process.

transition path in terms of their levels of old sector job destruction (JDold) and new sector job creation (JCnew). At the outset of transition, the Estonians destroyed jobs in the old sector at an annual rate of 14 percent of all jobs (or 25 percent of old sector jobs) whereas the Czech JDold rate at the outset was only 8 percent (12 percent) of all (old sector) jobs.[31] Thereafter the rates fell in both countries, but the decline was gradual in the Czech Republic and steep in Estonia. The level of JCnew was higher in Estonia than the Czech Republic, both at the outset and within two years after the start of transition, when measured as a share of all employment, which was falling in Estonia. During the first two years of transition, this rate was between about 6 and 10 percent of all employment in the Czech Republic and 9 to 12 percent of all employment in Estonia.

An interesting question is to what extent were old-sector firms restructured during transition. I can ask whether the new and old sectors were similar in terms of job reallocation rates at the end of my samples, when they provided an equal share of jobs in each economy. In both countries, the annual sectoral job destruction rates were indeed similar in the old and new sector; the job creation rates, however, were still much higher in the new sectors, suggesting a continuing difference in growth potential.

The plots in Figure 6.4 imply that JCnew and JDold alone account for the employment patterns seen in Figure 6.3. While it is traditional to describe reallocation rates by sector, reallocation should occur across sectors during adjustment periods. In Figure 6.5, I therefore consider the size and nature of worker flows from the old sector to the new sector.

First, to assess the magnitude and timing of the flow, the upper left

[31] See Appendix A.1 for a description of what economic policies were behind this different JDold evolution.

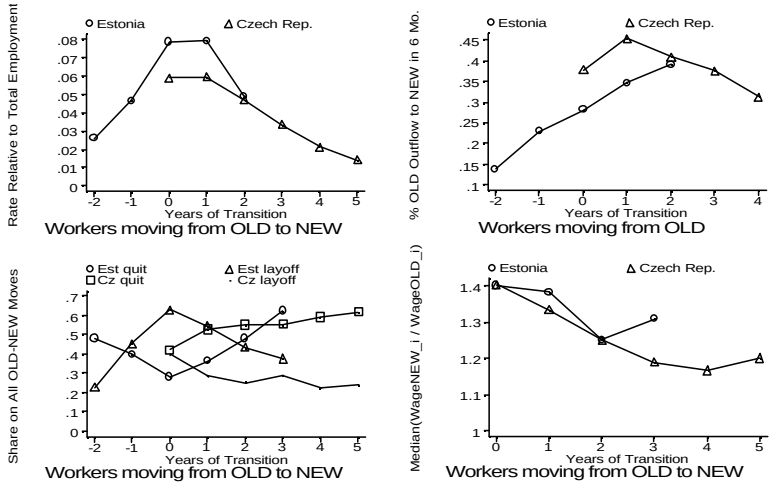

Figure 6.5: Worker Reallocation from OLD to NEW Sector.

graph of Figure 6.5 plots the number of workers moving as a proportion of total employment in my sample using the time of departure from the old sector to define the timing of the flows. In both countries, the first two years of reforms record the highest old-to-new reallocation rates. However, this peak of reallocation is higher in Estonia where I see annual worker old-to-new flows on the order of about 8 percent of total employment, compared to about 6 percent in the Czech Republic. These two years of high reallocation are followed by a decline - to about 5 percent - in the third year of reform in each country.[32]

[32]In the Czech Republic, where my sample frame extends further into transition, I see a gradual and sustained decline in old-new worker flows. However, this is in part due to the nearing end of my sample frame (December 1996) and censoring of ongoing non-employment spells that may eventually end up with new-sector hiring. Note that

In Figure 6.4 I see a much higher JDold rate in Estonia. Does this result in less efficient old-to-new sector outflows, i.e. fewer leaving the old reaching the new sector? [33] This suspicion is confirmed by the upper right graph of Figure 6.5, which shows the fraction of old-sector separations resulting in new-sector hires within six months of the separation. The graph suggests that during the peak years of reallocation, a much higher fraction of workers leaving the Czech old sector arrived in new-sector jobs as opposed to those separating from old Estonian firms.[34]

The lower left plot of Figure 6.5 asks to what extent I find workers leaving the old sector voluntarily vs. being laid off. The graph indicates that in the Czech Republic, where JDold rates never reached very high levels, quits outweighed layoffs for all old-to-new sector moves throughout the transition. Hence, transition was carried out by old-sector workers quitting their traditional jobs for the new sector. In contrast, the dramatic Estonian JDold in 1992-93 is manifested by the dominant role of layoffs

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in Estonia, where I only observe the first four months of 1995, I am unable to estimate the 1995 level of reallocation. Yet, I can count workers completing the transition to the new sector during 1995 into the 1994 reallocation measure.

[33] Efficiency is important as I would like to know the extent to which outflows from old unproductive jobs result in churning among old-sector jobs vs. moving to a new private sector job. For example, OECD (1998) suggests that there has apparently been substantial labor turnover in Russia in the 1990s. However, it is not clear to what extent this turnover has been efficient in reallocating labor to its best use.

[34] The fraction of completed old-new moves that occurs with less than one month of an intervening non-employment spell was about 60% at the outset of transition in Estonia and only somewhat higher at the start of Czech transition. In the second year, almost 80% of Czech workers who leave the old sector and find a job in the new one make the move within one month, compared to almost 70% in Estonia.

for Estonian old-to-new flows.

In the lower right graph of Figure 6.5, I ask about the wage premium from moving to the new sector. The realized wage gain from the old-to-new move follows a very similar pattern in both economies, starting at about 40% during the first year of reforms and gradually declining afterwards. I find a similar pattern comparing the median wages of all workers employed in each sector.

One can further investigate the nature of the old-to-new flows. It is interesting to note that while industrial reallocation is an important part of the old-to-new flows, in some years almost a half of all old-new worker moves did not constitute a move across a broadly defined industry classification (15 main ISIC/NACE sectors). Most of the employment (growth) in the new sector can be accounted for by small firms, defined here as firms with less than 100 employees. These firms, provide about 90% of all new-sector jobs during early Czech transition, bearing the sole responsibility for Czech JCnew and, hence, Czech low unemployment. While the share of small firms on new-sector employment in Estonia is also overwhelming, at over 85% in the first two years of transition, a significant share of employment comes from firms employing over 100 workers.

Next, I ask about the nature of the relationship between the two main job flows, JDold and JCnew. This is motivated by the theories that focus on their evolution and potential feedback.

The upper two graphs of Figure 6.6 plot the contemporaneous values of monthly JDold and JCnew counts together with fitted regression lines. The surprising feature of the data is that the smooth Czech annual job reallocation measures (of Figure 6.4) hide a great deal of volatility at the monthly frequency, with most action occurring at the beginning of each

calendar year. Yet, it would appear to the naked eye that the two series move closely together; the Czech labor market seems frictionless as any number of jobs destroyed in the old sector is matched in the same month by an equal number of jobs created in the new sector. The R^2 of the linear regression of JCnew on JDold and a constant is 0.68 and the slope coefficient is 0.92 with a standard error of 0.07. The picture is a lot less sharp in Estonia, where a quadratic term is statistically significant in a regression of JCnew on JDold reaching an R^2 of only 0.39.

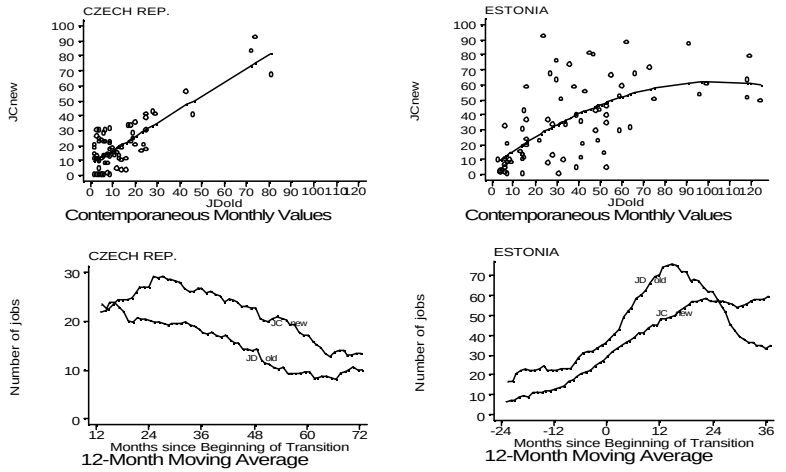

Figure 6.6: Jold and JCnew Time Series.

Given that total Czech employment remains relatively stable, it is not surprising that JDold and JCnew have a stable long-run relationship.[35]

[35]Indeed, the monthly series are 1-1 co-integrated in the terminology of time series analysis. Both series are non-stationary of unit root; these results are available upon

This is confirmed in the lower left graph of Figure 6.6, which plots the twelve-month moving average of the monthly JCnew and JDold. While at the outset of Czech transition the filtered JDold exceeds JCnew, job creation soon starts to dominate job destruction and both measures gradually decline in parallel for most of the transition. In Estonia, on the other hand, JDold is the dominating force until late into transition. When JDold skyrockets in Estonia, JCnew appears to grow at a steady rate until it stabilizes almost a year after the peak in JDold. It remains an open question whether JCnew level stabilized because job creation reached a natural level (e.g., having filled the market niche of understaffed market-oriented industries) or whether it was slowed down by other causes (such as the earlier spike in JDold, see below).

6.3. Interpreting Results in the Light of Theory

Here I ask about the usefulness of the macroeconomic theory for understanding the observed reallocation patterns. I consider these patterns within each country separately and also try to learn by comparing the gradual Czech vs. rapid Estonian approach to the destruction of the communist economy. In much of my analysis of these patterns I rely on difference-in-differences reasoning to avoid invoking assumptions of equal initial conditions, e.g., the extent of misallocation and/or level of development.

The Czech-Estonian comparison is useful for reasons in addition to their different rates of old-sector scrapping. The Czech transition, in comparison to Estonian, was characterized by extensive appropriability problems (see below for details), which is useful for evaluating the CH

request.

(1996a) theory. Yet, the analysis of the Czech low-unemployment transition is perhaps particularly important for the OST literature, which advocates gradual phasing out of the state sector as optimal. At the optimal speed of old-sector demolition, jobs in the new sector are being created at a pace that balances the rate of decline of the old sector; unemployment may rise at the start of transition, but should stay stable once the optimal speed has been reached. The Czech transition unemployment followed such a scenario, in sharp contrast to the continuous rise of Estonian joblessness. Does this resemblance of Czech transition to OST prescription hold at closer inspection?

6.3.1. OST Theory

First, I ask whether my findings are in accord with the OST theory's perspective and focus. Indeed, the evidence in Figure 6.3 suggests that the OST models are correct in dividing the economy into these two sectors and focusing on job creation in the new sector and job destruction in the old sector since these two job flows appear to constitute all of job reallocation at the beginning of transition. In other words, the OST literature is correct in ignoring potential job creation in the old sector and job destruction in the new firms. This success may be surprising since my definition of the old sector includes privatized firms, which could be producing new jobs. Further, the potential for a significant level of job destruction in the new sector is perhaps a more serious challenge to OST theory since it is well known from US data that new firms are likely to fail early on (see e.g., Davis and Haltiwanger, 1999).[36] Indeed, as

[36] High uncertainty characterizes initial phases of transition, implying that new-firm deaths and JD could be high in transition economies. On the other hand, the *de*

transition proceeds, there appears to be more churning in the new sector as separations and JD rise.[37]

Second, are my findings in accord with the evolutionary "organic" perspective and the dynamic properties of the OST story (do I observe movements along the inverted "U" curve)? As seen in Figure 6.3, the job (employment) transfer was "organic," without major breaks due to, e.g., mass privatization.[38] The theory predicts that the gradual Czech JDold should result in an extended period of moderate, but constant reallocation, which is also the case. Moreover, in the Czech Republic, the economy quickly converged to a stable level of unemployment at which the rate of change of JDold equaled the rate of change of JCnew as prescribed by OST (Figure 6.6). Whether this pattern corresponds to the optimal rate of reallocation (upper left quadrant of Figure 6.1) or sub-optimal transition (bottom left quadrant of Figure 6.1) will be investigated below.

On the other hand, in Estonia there was no extended time period during which JCnew was equal to JDold. Moreover, unemployment was rising. Estonian transition fits the OST story in that rising JDold concurs with a rising JCnew and an increasing flow of workers moving from the old to new sector. This may correspond to climbing up the inverted "U" curve of Figure 6.2. That is, JCnew grows when JDold shoots up

novo private firms are likely to locate in the market niches left wide-open by the inappropriate allocation of resources inherited from central planning.

[37] The assumption of government policy being the main driving force behind the speed of job destruction in the old sector also appears realistic. One of the main instruments of such policy was the banking sector.

[38] Moreover, the curvature of the trajectory describing the increasing size of the new sector in 6.3 follows the prediction of the Castanheira and Roland (2000) model: slightly convex at first and turning concave later on.

possibly because the government is rapidly downsizing the old sector to speed up transition by raising unemployment and lowering wages.[39] Here the theory has a clear prediction. If the rapid scrapping of old firms is too fast, I should see a drop in JCnew (bottom right quadrant of Figure 6.1), but in fact JCnew continues to grow at a steady rate after JDold peaks. Interpreting this evidence within the Aghion and Blanchard (1994) model, this would suggest that the 25% annual destruction rate in the old sector during the first two years of transition is not too high for Estonia. But then the theory would have JCnew relatively quickly catch up with JDold (upper left quadrant of Figure 6.1) while in fact JCnew only catches up with JDold late into transition when JDold is already decreasing. Hence, the grip of OST on Estonia is not perfect.

At a very basic level, one may be suspicious about the OST JD?JC feedback prediction because the higher JDold in Estonia (double that of the Czech Republic) coexists with a level of JCnew only somewhat higher than that of the Czech Republic. Nevertheless, this fact could well fit within the OST theory if the high Estonian JDold is not too high compared to the optimum Estonian rate and the Czech JCnew is lower than the attainable maximum. This seems to be confirmed by the estimation I perform below.

The core of the OST theory, represented in Figure 6.2, is in the inverted "U" relationship between the speed of job creation in the new sector and the level of unemployment or non-employment.[40] I estimate

[39] Both countries enjoyed comparable rates of wage growth since the introduction of the Estonian currency.

[40] The motivation for using non-employment instead of unemployment is threefold. First, in Aghion and Blanchard (1994) workers are employed or unemployed; there is

this relationship using the time dimension of my data.[41] I regress 24 quarterly observations of JCnew in each country on the corresponding employment level, its square, and a constant. In the regressions, I use employment instead of non-employment because population size remains stable in both countries, and therefore changes in employment capture the (minus of) changes in non-employment over time. These regressions are presented in Figure 6.7.[42] In both countries, both coefficients of the quadratic function were individually statistically significant at the 5% level, with correct signs in terms of the OST theory; attempts to estimate a higher-order polynomial failed.

In Estonia, the behavior of JCnew and employment over time track the concave theoretical relationship postulated by OST with a high fit ($R^2 = 0.88$). Using this suggestive evidence about the theory's validity, one can use the estimated patterns to assess the optimality of the actual macroeconomic policies. In this regard, Estonia exhibits a striking resemblance to an optimal transition. JCnew rises as employment decreases (non-employment rises) and most of the reallocation (job creation) occurs at the optimum level of non-employment, i.e., where the mass of

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no participation decision. Second, they note that pensions and social benefits require tax increases similar to those required by unemployment insurance benefits. Third, distinguishing between unemployment and out-of-labor-force may be hard in early transition.

[41] If the model is correct, the variation I use for estimation comes from the government adjusting the speed of destruction and from the convergence along the OST curve to the level of unemployment where creation equals destruction (see Section 6.1.2).

[42] The horizontal axis of Figure 7 normalizes employment to the base year so as to show more easily rising/falling non-employment (i.e., 1-employment) and to be able to standardize the axes for the two countries.

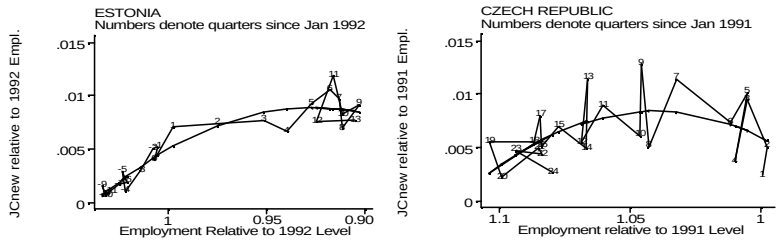

Figure 6.7: OST Curve.

points is at 1 – E = 0.10.

The Czech Republic does not conform to the OST models in that employment actually rises. While I can offer no explanation for this finding, I can ask about the insight of OST theory conditional on the (underlying) rise in employment. The insight is further limited in that the Czech "OST regression" attains an R^2 of only 0.25. Still, there appears to be a level of employment maximizing the rate of job creation. In contrast to Estonia, however, the Czech economy passes through this point and most of reallocation occurs at sub-optimal job creation rates at a too-high employment level.[43]

Above, I focus on the essence of the OST theory—the evolution of job and worker flows. Next, I can also ask about the specifics of the proposed channels of JD-JC feedback within particular OST models. First, in the Aghion and Blanchard (1994) model, wages were to be depressed and

[43] Recall that efficiency improvement is the result of more new-sector jobs with higher productivity.

taxes increased as unemployment rose. Second, in the Castanheira and Roland (2000) analysis, high unemployment would depress savings.

One could reject the Aghion and Blanchard (1994) model by pointing out that taxes were not raised during transition in either of my two countries in spite of growing unemployment. Furthermore, taxes were higher in the Czech Republic where JC exceeded JD throughout transition (see Table A.1 in the appendix for tax revenues). However, given that in the Czech Republic most reallocation occurred as job-to-job flows, unemployment did not need to play a role in depressing wages. Supporting the Castanheira and Roland (2000) model, savings did remain stable in the gradualist Czech economy and did decrease during the high-unemployment Estonian transition. Yet, the main cause of the savings decline could have been the Estonian hyperinflation.

The Boeri (1999) critique of the OST theories is that they focus too much on push effects of old-sector scrapping decisions as opposed to the pull effects of the new-sector labor market as the main force of labor reallocation during transition. In the Czech Republic, quits were the dominant way of transfer from the old to the new sector. However, this pattern is in accord with the Castanheira and Roland (2000) OST model, where old firms that are not forced to layoff massively due to soft budget constraints, but keep wages low, i.e., close to the actual productivity level, will see their workers leaving for the new sector, where wages and productivity are higher. In this respect, it is important to stress that most medium and large Czech firms were affected by wage controls during 1991-1995 (see Flek, 1996). This policy may have made the pulling of labor from old to new sector easier, saving the transition in terms of the Castanheira and Roland (2000) model.

If I observed a very high new-sector wage premium in the Czech Re-

public, where there were relatively few layoffs from the old sector, but a low premium in Estonia, one might be tempted to interpret the wage premium as a pull factor necessary to lure workers out of their old jobs, signaling that low JDold is a bottleneck for reallocation. However, given the similarity of wage patterns in both countries, the premium is more likely a result of a selection on benefits from moving, where the old-sector workers with the highest potential profits and earnings in the new sector move first.[44]

My data cover only three years of transition in Estonia, but provide a longer view on the Czech reallocation. The fact that in later transition there was a significant decline in the number of Czech workers moving from old sector to new sector can be interpreted as suggesting that transition was nearly complete five years after reforms started. Alternatively, it may mean that the transition slowed down after the first few years. The narrowing old/new sector wage differential over time might also signal that the transition is nearly over. Since the narrowing is the result of more rapidly rising old sector wages, it may mean that the workers in this sector are becoming more productive over time as the redundant workers leave and differences in labor productivity between the old and new sector is being eroded. On the other hand, the transition may have slowed down because of very soft budget constraints (SBC) in the Czech Republic, where evidence of SBC exists (e.g., Lízal and Svejnar, 2000, and Table A.1). To provide more definitive evidence, future research needs to compare productivity in the old and new sectors at the end of my sampling frame.

[44] Recall that my definition of the new sector contains self-employed and small firms where the profit sharing is likely to be high.

In sum I offer some support for the OST theory, including the inverted "U" relationship between employment changes and new-sector job creation, but I reject some of the specific channels of the JD-JC feedback mechanism. Making the strong assumption that the required fundamental need for reallocation was the same in the two countries, the conclusion in terms of OST would be that while transition is indeed slower with slow JDold, Czechs have spent only two extra years in transition in exchange for much lower unemployment.[45] Hence, for some the ultimate lesson may be that Czech JCnew was as high as the Estonian JCnew without the cost of mass layoffs and rising non-employment.

6.3.2. CH Theory

How do the transition experiences of Estonia and the Czech Republic compare to the assumptions and workings of the CH models discussed in Section 6.1.1? The theory predicts that in a world with optimal CH policies, i.e., policies that slow down JD *and* boost JC, I should see synchronization of JC and JD into efficient job reallocation, as in the first graph in Figure 6.1. This outcome could also arise in a world where there was rapid downsizing of the old sector and no frictions in job creation. However, in a world with frictions, gradual JD and no boost to JC, there will be a "decoupling" of JDold and JCnew and inefficient reallocation, with high unemployment. Finally, rapid JD will make the outcome in the previous situation even worse, as in the top right graph of Figure 6.1.

What do I know about these two countries' contracting difficulties and

[45] Another caveat is that Estonian privatized firms may be more efficient due to a more effective privatization process. This would further shorten the length of Estonian transition in terms of reallocation and restructuring.

the policies CH refer to? First, with respect to contracting difficulties in the formation of production units, it would appear that the Czech environment is far more problematic than the Estonian environment. The Czech Republic is infamous for its weak legal structure, impotent judicial system, asset stripping ("tunneling" or "looting," see, e.g., Cull et al., 2001), Weak collateral rules,[46] financial markets that lack transparency, poor investment protection, [47] etc. Hence, it would appear that at least in the Czech Republic, appropriability frictions are important. I believe that the Estonian legal environment was more transparent and open to foreign investment. A number of laws governing the business environment were enacted very early in Estonia's transition (Bankruptcy Law, 1992; Law on Competition, 1993). According to indexes constructed by the E.B.R.D. for the end of the 1990s, Estonia had a better rating of the effectiveness of commercial and company law (EBRD, 2001).

Second, it is also important to know whether the destruction of the communist economy was complemented with vigorous assistance for job creation. This is especially important for the Czech Republic, given the prevalent contracting difficulties there. Official statistics indicate that there was more overall credit available in the Czech Republic than in Estonia; unfortunately, there is no evidence on the share of bank credit going to small new firms in either country.[48] Still, survey evidence from

[46] At least as late as 1996 creditors in the Czech Republic had to obtain the permission of the debtor in order to seize the collateral for loans in default.

[47] Consider, for example, the case of a highly profitable commercial TV channel (TV Nova) being taken from the original U.S. investor by a local partner (New York Times, 1999)

[48] My calculations from official statistics indicate that total credit available as a

Central European countries suggests that their credit markets provide *de novo* private firms with large amounts of financing from early stages of firm existence and that credit for newly established firms is more available in the Czech Republic than elsewhere (Bratkowski et. al, 1999). I also know that the relative share of GDP allocated to active labor market policies, another source of financing for startup firms, was far lower in Estonia than in the Czech Republic (0.19 percent vs. 0.08 percent during the 1990s, see Riboud et. al, 2001).[49] In sum, it appears that Czech job creation did receive substantial support, especially in comparison to Estonian transition.

Are these policy settings consistent with my empirical findings within the CH theory? It appears that the Estonians followed a rapid policy of job destruction but devoted little resources to boosting JC in an environment where there were relatively few frictions. The job reallocation patterns in Figure 6 reveal "decoupling" of JC and JD for Estonia occurring at a relatively high level of job creation. The economic environment must have been indeed relatively free of serious contracting frictions to allow for the vigorous creation of new jobs, in spite of the lack of government support. Nevertheless, the rapid JDold was far greater than the rate of job creation in Estonia, leading to a rising high level of unemployment created during this period. It remains an open question whether with JC

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percentage of GDP was about 66-69 percent in the Czech Republic (1991-94) whereas it was only 14-17 percent in Estonia (1994-95). More importantly, new credit was about 10-12 percent of GDP in the Czech Republic (in 1993-94) whereas it was only 2 percent in Estonia (1994-95).

[49] Moreover the level of government budget per capita was greater in the Czech Republic. The active policies allocated resources to help unemployed start new businesses (see Boeri and Terrell, 2002).

support, the rate of JCnew would rise above the annual rate of 12 percent of all employment.

On the other hand, the Czech Republic followed gradualist policies in an environment apparently full of frictions and allocated some resources to creating jobs in the new small-scale sector. My job reallocation measures show powerful synchronization of JC and JD for the Czech Republic, but at a much higher frequency than that considered by CH. Given the presence of frictions, the JC support must have indeed been very effective to result in the ability of the monthly JC to match any JD level. Looking at a filtered time series, I see JD and JC again synchronized, but at a relatively low level of reallocation. Even vigorous JC support therefore did not result in a concentration of reallocation in a short time span as in the efficient CH reallocation.

Neither country therefore appears to closely "fit" the highly stylized CH model. Yet, one can draw a lesson applying the CH theory to the Czech evidence in that it appears that the effect of even extensive frictions can be avoided with some support for job creation.

6.3.3. U.S. Empirical Literature

Finally, let me conclude the discussion of my empirical results on job flows during an unusually deep structural recession with a comparison to the stylized facts from the U.S. literature on the cyclicality of job reallocation.[50] First, the U.S. job reallocation is large-scale and incessant (in the U.S. on average one job in ten is being created and destroyed every

[50] See, e.g., Davis and Haltiwanger (1990, 1992) and Blanchard and Diamond (1990). For similar analysis from Germany see Boeri and Cramer (1992) and for Italy Contini et al. (1994).

year). Perhaps surprisingly, reallocation rates in the first two dramatic years of transition appear comparable in magnitude to those from the developed world and even fall afterwards. It is important to note, however, that relatively mild job flows in post-communist economies are effective in supporting extensive reallocation from the old to the new sector.

Second, in the U.S. there is a negative correlation between JC and JD over the business cycle, at least in the manufacturing industry. In contrast, I see co-movement of JD and JC over the transitional recession of the early 1990s. There is even strong positive correlation of JD and JC at high frequency, especially in the Czech Republic. How can one explain this difference? My results are consistent with the Mortensen and Pissarides (1994) and other models to the extent that the dispersion of the shock to individual firms (new versus old) is the driving force of transition, as opposed to the aggregate shock of the collapse of the communist regime. (Aggregate shocks, such as the oil crises, affect all sectors of the economy whereas allocative shocks are dispersed across sectors and firms.)

Finally, another important difference to the U.S. findings on job reallocation is that small firms apparently create and sustain most jobs during transition: Small transition firms not only have high gross creation rates, but unlike in the U.S., they exhibit relatively low destruction rates (see Davis, Haltiwanger and Schuh, 1996, for the relevant U.S. results).

6.4. Final Remarks

This study sheds light on the process of reallocating jobs and workers during economy-wide structural adjustment in two transition economies—Estonia and the Czech Republic. Using uniquely comparable data in these two countries, I am able to compare and contrast their patterns of job

creation and job destruction in light of theoretical predictions from two classes of models that deal with job reallocation, but have been applied to different parts of the world. I show that in transition economies reallocation occurs along a single dimension: from obsolete state enterprises to small new private firms. The extent of reallocation is stunning as only a few years into the transition, in each of these countries small *de novo* firms provide more jobs than large old firms, which existed prior to 1990. Yet, most of transition research focuses on the issue of enterprise privatization as a way of creating the new economy and private sector employment.

This study's contribution to the research on job reallocation is fourfold. First, I extend the existing literature by contrasting in detail the evolution of job reallocation in two economies facing massive adjustment and using different economic policies to deal with the challenge. Second, I describe reallocation for the entire economy, including all firm sizes and economic activities, and not just for one sector as is typical in much of this literature. Third, I illustrate the usefulness of individual-level data for macroeconomic analysis, although I am not the first to do so. Fourth, and most important, I relate the empirical findings to economic theory and bring together two literatures that have not been contrasted before—the gradualist theories motivated by transition from central planning and the creative-destruction-with-frictions literature motivated by adjustment crises of the developing world.

I find that these two bodies of macroeconomic theory are useful in helping me understand the process and needed policies in transition economies. Both countries, under some assumption fit the dynamic pattern of the OST models. Following the OST logic, the Czech process may have been sub-optimal in that it may have been too slow and the Estonian process may have been optimal in terms of maximizing the net present value of

output—the optimality criterion of the OST models. However, it only took the Czechs two more years to obtain the same amount of reallocation as the Estonians, with a much lower level of unemployment.

With respect to the Caballero and Hammour (1996b) model, I find that the Czech Republic's pattern of job destruction and job creation is highly synchronized while the Estonian pattern is one of de-coupling at relatively high level of reallocation. I draw the lesson that even in an environment with contracting frictions, one can have synchronization with a low rate of reallocation when there is support for job creation, as there was in the Czech Republic.

Returning to the question in the introductory section posed by Caballero and Hammour (1996a), my research would suggest that gradualism may have redressed the transitional employment problem in the Czech Republic. However, the Czech (Bulgarian, Romanian) soft-loan gradualism leads to corruption and reduces the transparency of the economy, such that it may not be a long-run solution. Moreover, the gradual destruction of jobs in the old sector and the policy to keep wages relatively low there, meant that most of the reallocation in the Czech Republic was driven by (likely more productive) workers (selectively) quitting and looking for jobs in the new sector. This type of transition process may therefore Iaken the old sector's chances of improving productivity.

Using very different policies, the Czech and Estonian economies ended up with similar levels of reallocation in relatively short time periods. However, the longer-term outcomes of these processes are likely to be dissimilar; future research is needed to shed light on the ramifications for growth of different reallocation processes. First and foremost, studies directly measuring productivity differences can confirm whether this old-new reallocation indeed leads to productivity increases, and whether the

new-sector productivity gains depend on the type of reallocation process. Second, the nature of the transition path may make it more or less difficult for the new economy to move into a steady-state creative-destruction reallocation. I.e., the nature of initial restructuring can affect the existence of reallocation sclerosis or labor market segmentation (e.g., Caballero and Hammour, 2000). These are important questions that can be addressed using my approach to more recent data.

7. Microeconomics of Reallocation

In this Section I focus on microeconomic aspects of the early-transition job growth. The goal is to learn about the characteristics of the job growth by contrasting the transition paths of the two sample countries. Using the distinction between old- and new-sector jobs, this Section asks to what extent newly created jobs are shaping the economies into more mature market economies in terms of both industrial and firm-size structure. The previous macroeconomic comparison of the gradual Czech and rapid Estonian transition paths found similar levels of aggregate job creation on the background of dramatically different levels of job destruction, unemployment, and social safety nets. The second line of questioning in this Section therefore asks if these paths led to the creation of different types of jobs. First, since much of the Czech old-to-new reallocation occurred as a result of voluntary worker moves from old to new firms in an environment of low unemployment, while more of the Estonian reallocation resulted from layoffs than from voluntary quits, I expect higher new-old wage differentials in the Czech Republic than in Estonia. Similarly, the demographic composition of the new sector may be expected to differ under the more voluntary reallocation, with a larger fraction of

young workers who can better reap benefits from investing into new skills required in start-up enterprises. Second, the share of low-wage jobs in all newly created jobs may be higher in an environment with a high incidence of unemployment and low benefits than in an environment of low unemployment and adequate benefits. Hence, it is interesting to ask to what degree the new sector served as a depository for the unemployed, especially in Estonia.

Figures 7.1 and 7.2 offer a direct comparison to Figure 6.3 from the previous Section: while previously I coded all hiring in Estonia after 1992 as corresponding to the new sector, here I differentiate based on the firm size (see Section 5.1). The new Figures also set the aggregate stage for my inquiry about the nature of job creation in early Czech and Estonian transition. The top two graphs summarize changes in employment structure in each country, while the remaining graphs show the evolution of job creation and destruction. I recast time in terms of the start of the reforms; year 0 corresponds to 1991 for the Czech Republic and 1992 for Estonia.

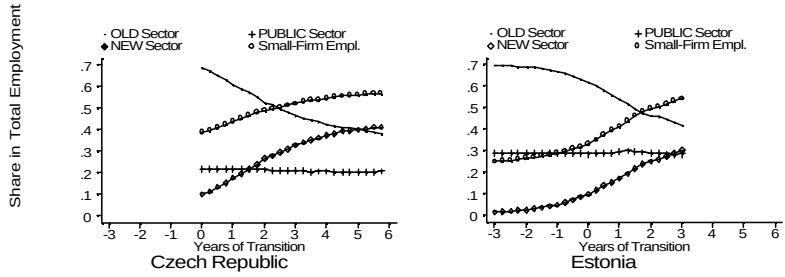

Figure 7.1: Employment Structure

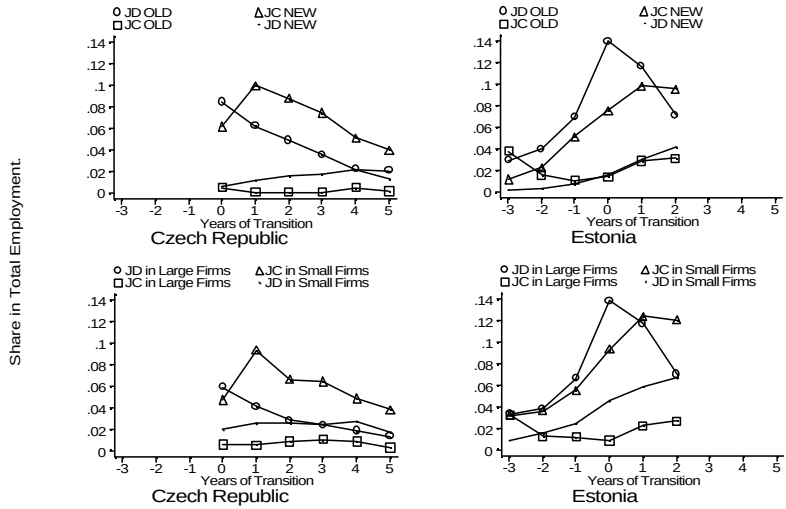

Figure 7.2: Job Reallocation

Beginning with the Czech Republic, the upper left graph implies a striking growth of the new sector during the early reform period in the Czech Republic. The start-up firms provide more jobs than the old firms only five years into the transition process. It is also clear that the rise of the new sector closely corresponds to the growth of small firms, defined as firms employing less than 100 workers (irrespective of firm ownership). This is natural because start-up firms are typically small. In fact, about 90 percent of Czech new-sector employment occurs in such small firms. The public sector holds on to a stable fraction of total employment and is omitted from the subsequent analysis. The next graph shows the evolution of job reallocation in the Czech old and new sectors. It implies that the old sector is responsible for almost all of early-transition job destruc-

tion while almost all of job creation occurs in new firms. The new/old categorization allows one to separate job creation from job destruction during early reforms. Finally, the last graph in the upper row of Figure 7.1 confirms that one can think of the new sector and its vigorous job creation as corresponding to the rise of small firms.

The bottom row of Figure 7.1 presents Estonian results based on my approximation of the new sector there. As I explain in Section 5.1, I cannot distinguish privatized (old) from start-up (new) jobs for Estonian employment spells starting after 1992 so I categorize employment spells starting in small firms as being in the new sector and assign those spells starting in large firms to the old sector. Using this approximation, the rate of the new sector growth in Estonia is similar to that in the Czech Republic. A comparison of the upper and lower graph shows that three years into transition, the old sector in both countries still provides a larger share of total employment (about 10 percentage points more) than the new sector does.[51] However, as the next graph shows, the employment reallocation in Estonia occurs on the background of drastic job destruction in the old sector. Job creation in the new sector rises quickly, but surpasses job destruction one year later into transition compared to the Czech results. The last graph of Figure 7.1 then offers a comparison to the Czech findings that is not affected by measurement error. Using the small/large firm distinction I again find the job reallocation rates to be much higher in early Estonian transition than in early Czech transition.[52]

[51] If I assign all hiring in private firms in Estonia to the new sector, it provides as many jobs as the old sector at the start of the third year of transition.

[52] Job destruction in small firms is higher compared to that in new firms because of the scrapping of jobs in old small firms. Given that job creation equals the sum of

In both countries, early-transition job creation occurs almost solely in small firms. The firm-size patterns of job reallocation imply swift changes in economy-wide firm-size distributions during the early reform period.

Below, I explore the characteristics of this new-sector growth. There are some characteristics I would expect in all transition economies as they become market oriented. Specifically, I would expect that the new sector creates relatively more jobs in industries (economic activities) that represent greater employment and output shares of market economies compared to planned economies (e.g., trade, restaurants and hotels, financial and other services). Given the scarcity of small firms under central planning, I expect the new job creation process would lead to convergence in firm size structures to that of the more mature market economies.

In addition to these patterns for transition countries in general, I also expect differences in the evolution of the new sector and its characteristics in Estonia and the Czech Republic because of their different patterns of job destruction and relative levels of unemployment and social safety nets. First, given the higher level of unemployment in Estonia, and given that a larger share of the Czech old-to-new reallocation occurs as voluntary moves while mass layoffs are more important in Estonia (Jurajda and Terrell 2001),[53] I expect positive self-selection based on benefits from moving to the new sector to play a larger role in the Czech Republic (Roy 1951). This would suggest a higher wage differential between the

job destruction and net employment change, this also pushes up job creation rates in small firms.

[53] In Jurajda and Terrell (2001), four job exits are considered: voluntary quits, layoffs, out-of-the-labor-force and other moves. See Lehmann et al. (2002) for an analysis of displaced Estonian workers using the same data, but a different categorization of job exits.

new and the old sector in the Czech Republic.[54] For the same reason, one may expect the workers in the Czech new sector to be younger than the workers in the Czech old sector, whereas in Estonia there may be less of a difference in the demographic characteristics of workers in the new and old sectors.[55] Second, given that displaced Estonian workers are unlikely to live on an unemployment benefit equal to 10 percent of their previous wage, job search theory suggests that they may be more likely to accept jobs of poorer quality so that the new sector in Estonia may partly represent a repository for the unemployed.[56] In the following five sections, I gather evidence on each of these expectations.

[54] The same prediction is delivered by the macroeconomic model of transition of Castanheira and Roland (2000), in which slow job destruction in the old sector makes new firms offer higher wages in order to pull workers from the old firms.

[55] This prediction is based on the assumption that selection on observed worker characteristics is stronger in a worker reallocation process driven by voluntary quits than in one driven by mass layoffs. Younger workers are expected to be more likely to voluntarily move to the new sector because they have a longer time horizon to reap benefits from investing into skills required in the new sector. On the other hand, I expect less of a selection on age in the mass layoff process.

[56] Workers with lower unemployment benefits would be more likely to accept low-paying jobs if they are liquidity constrained and cannot self-insure. Given that the Estonian hyperinflation reduced the value of savings and family income in general, I find these assumptions likely to hold.

7.1. Industrial Reallocation

This section provides new evidence on the industrial distribution of job reallocation in early transition.[57] I start in Figure 7.3 and the following Figure with estimates of the annual industry-specific job creation and job destruction rates (as a fraction of industry employment) for eight industrial branches.[58] I find in all industries that there is a higher level of job reallocation (JC + JD) in Estonia than in the Czech Republic. Taking an average across industries and time periods, the Estonia level of job reallocation is approximately twice the level of the Czech reallocation. This is because of both higher JC and higher JD in Estonia (JD being especially high in Estonian agriculture, but also in trade or finance, which enjoy a very high JC). The time pattern of JC is different across the two economies in some of the industries. Whereas JC was already declining in most branches of the Czech economy by transition year two, JC was on a rapid rise in Estonian manufacturing, construction and service industries. Overall, the patterns of JC and JD are very different across industries and across the two countries for a given industry, indicating very different processes.

What is the result of these industry job flows in terms of sectoral reallocation of employment? Each graph of Figure 7.5 (and the immediately following Figure) shows the evolution of two indicators for each of my

[57] Here my individual-data analysis complements the firm-level work of Faggio and Konings (2001) based on medium and large firms. My evidence is also complementary to the extensive research on worker reallocation across industrial branches (see Boeri and Terrell 2002, for a summary).

[58] The public sector (education, health, and public administration) is excluded from the analysis.

grouped industrial branches in the Czech Republic and Estonia. I plot the total employment in each industry as an index of its level at the start of transition (SIZE[59]) to highlight growing and declining industries and juxtapose to this the share of start-up employment in all jobs within the industry (NEW) to see where new-sector employment is growing most rapidly.

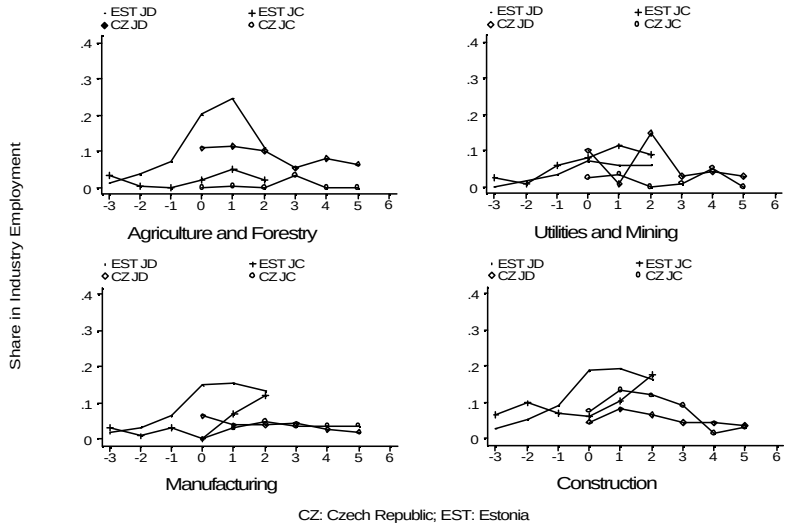

Figure 7.3: Job Creation and Job Destruction by Industry.

The patterns of industry employment (SIZE) during transition are well known and it is not surprising to see agricultural employment as well as employment in manufacturing decline, while employment of trade and

[59] The index is calculated as current industry employment divided by industry employment at the start of transition, minus 1.

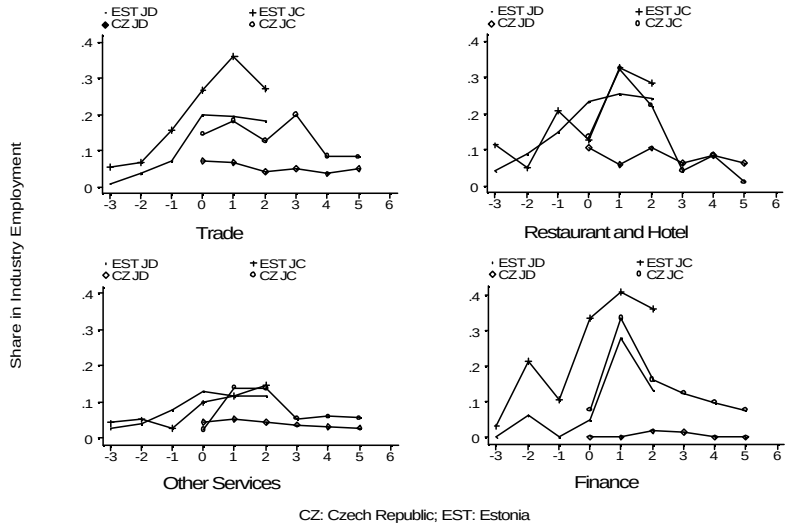

Figure 7.4: Job Creation and Job Destruction by Industry, Continued.

finance industry grows. The largest decline within each country occurs in agriculture, where employment fell almost 40 percent from the start of transition in each country, while wholesale and retail trade showed the largest gains in both countries. On the other hand, there are also sizeable cross-country differences in industry employment evolution. For example construction and services industries grow in the Czech Republic, but their employment stagnates in Estonia.

I expect new firms to contribute to the convergence of the industrial structure of transition economies to that typical for mature market economies. Indeed I find in Figure 7.5 that they constitute a large share of the growing new economic activities (NEW). Only three years into transition, over 60 percent of employment in trade and over 40 percent in the

construction industries is in start-up firms in both countries. However, Figure 7.5 indicates that start-ups grow in importance not only in expanding, but also in declining industries. After three years of reform, new firms provide approximately a third of all jobs *within* manufacturing and the service industries in each country, despite the misallocation *across* those two industry groups at the outset of transition. While manufacturing was over-staffed under central planning and shrank during transition, the number of new manufacturing jobs is comparable to the number of new jobs in the rapidly expanding trade industry in both the Czech Republic and Estonia.

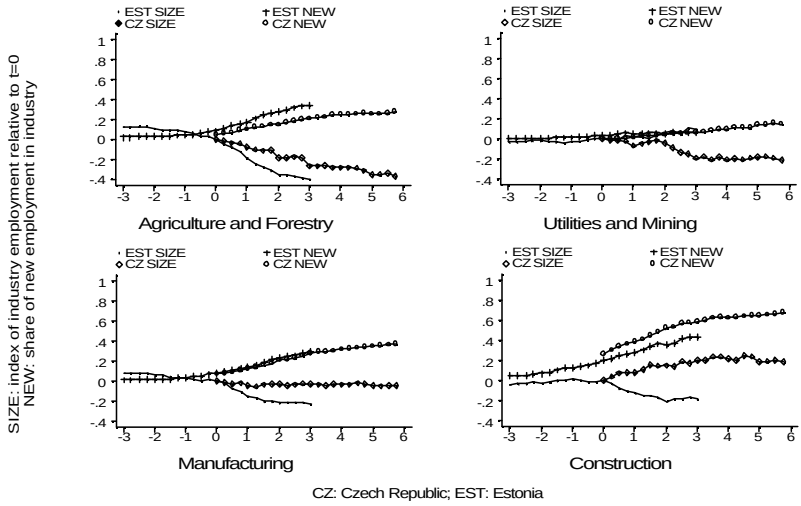

Figure 7.5: Industry Employment and Fraction New

This finding leads me to quantitatively compare new job growth across industries with new job growth within industries. How can I distinguish if

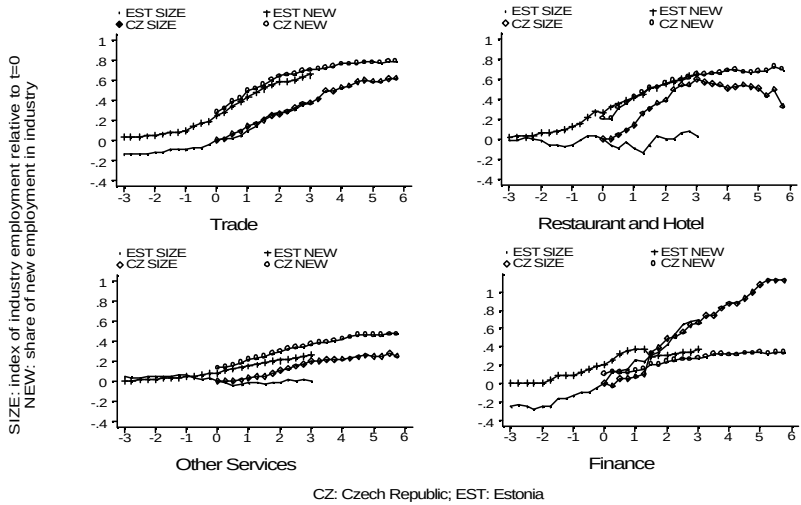

Figure 7.6: Industry Employment and Fraction New

new jobs emerge from reallocation across as opposed to within industry? In industries that are shrinking, all of new sector growth is due to within-industry job reallocation. (Reduction of employment in a given industry could have been achieved by scrapping of old jobs alone without any growth of new firms.) In growing industries, within-sector reallocation amounts to that part of new-sector job growth that replaces disappearing old-sector jobs. The remaining part of the new sector's growth in growing industries is then attributable to across-industry reallocation. I compare the start of transition (t=0) with transition year 3 in both countries and calculate the size of both "within" and "across" job growth using my main industry groups. In the Czech Republic (Estonia) the sum of within-industry new-sector job growth amounts to 18 percent (16 percent) of

the total employment at the start of transition. In contrast, the across-industry new-sector job growth is 11 percent for the Czech Republic and 5 percent for Estonia. In both countries, within-industry start-up job growth is quantitatively more important than increases in employment in new firms across industries.[60]

Finally, Figures 7.5 and 7.6 is surprising not only because of the large growth of new jobs within declining industries, but also because of the similarity in the share of new employment across countries. Even though Estonian and Czech transition followed a different policy path, reflected by a different pattern of job creation and destruction and a different evolution of total employment, the share of new jobs within industries in Figure 7.5 is quite analogous. However, my Estonian new-sector measure is only approximate. In Figures 7.7 and 7.8 I therefore offer a cross-country comparison of within-industry employment structure that is free of measurement error concerns. I find that the shares of small-firm employment within industries evolve in close tandem in most branches of the Czech and Estonian economy.[61] This pattern is discussed in the next section.

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[60] The total across-industry job destruction of old jobs over this 3-year period, which equals the sum of job losses in old firms in declining industries, is 18 percent in Estonia and only 5 percent in the Czech Republic.

[61] 7.5 also indicates that in the Czech Republic, the share of new-sector employment and small-firm employment typically move in close tandem, especially in agriculture and utilities and mining industries. In all of the other sectors, the new sector apparently grows somewhat faster as a share of industry employment than the small-firm employment, suggesting that small startup firms grow to cross the 100-worker threshold, which I use for distinguishing between small and large firms.

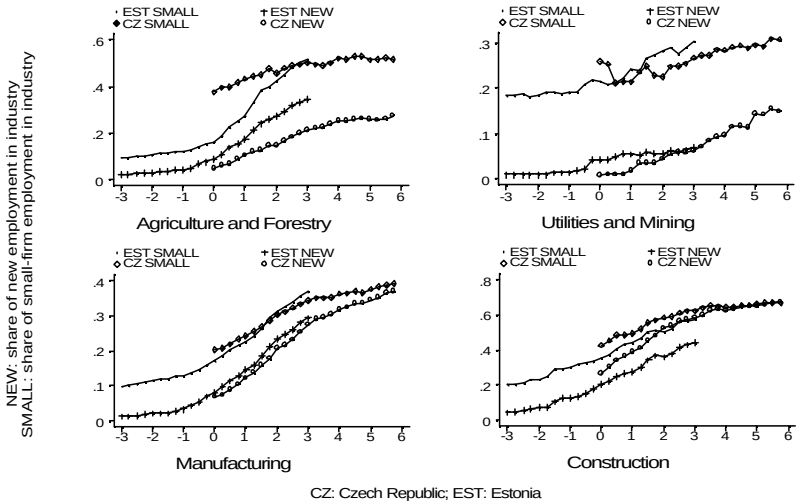

Figure 7.7: Industry Employment and Fraction Small.

7.2. Firm-size Reallocation

Why is it that new jobs are created not only in the niches left open by central planning (e.g. in services) but within all branches of the economy? And why is it that the share of new jobs in each industry's employment is similar across two different macroeconomic scenarios? It is a well-known fact that one of the main distortions of central planning was to do away with small firms. Given that almost all new job creation occurs in small firms, one natural interpretation of these reallocation patterns is that they are driven by convergence to "normal" industry-specific firm-size distribution.

While different open economies specialize in different industries given

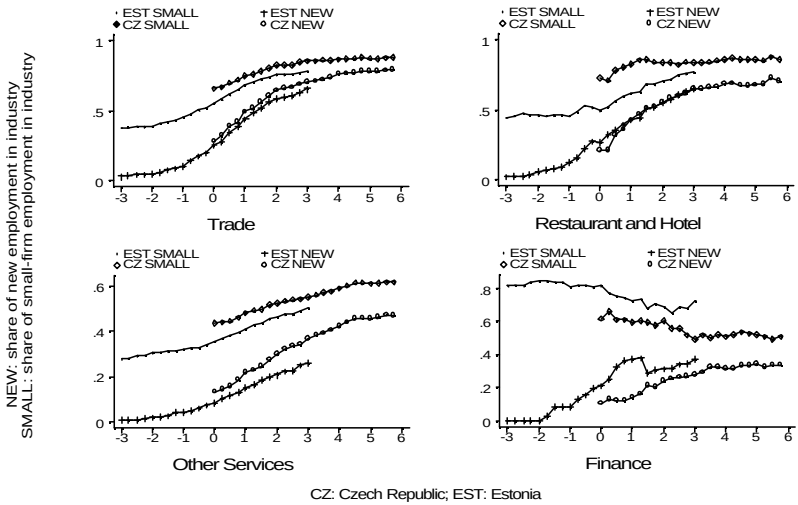

Figure 7.8: Industry Employment and Fraction Small.

their comparative advantage, it is more natural to expect the firm-size distribution within an industry to be similar across countries. For example, Kumar et al. (1999) analyze European data on average firm size by country and industry, and find that 63 percent of variation in firm size is attributable to industry identity and only 2.5 percent to country identity. This finding is confirmed in the top panel of Table 1, which provides a summary of the firm-size distribution over broad groups of industries from Austria in 1998 and East and West Germany in 1995. Indeed, comparing the fraction of workers employed in firms in the upper two categories (the lower two are not always strictly comparable) suggests a striking similarity

of firm-size distribution in Austria and West Germany.[62] These distributions provide one possible benchmark against which one can measure transition reallocation.

The bottom four panels of Table 1 contain industry firm-size distributions in the Czech Republic and Estonia at the start of transition and then again in mid-transition. The initial distortion towards large firms is clear, especially in manufacturing, construction, and services. It is also equally clear that there was a substantial shift toward western distributions and this shift roughly "explains" the growth of the share of the new-sector employment within each industry. I find in the Czech Republic, where I have a direct measure of the new sector, that there is a 0.93 correlation between the share of the new sector employment in each of the eight industries and the corresponding employment share of firms with less than 100 workers in December 1996.

[62] The statistics are based on representative samples of social security records excluding the public sector. See Bender et al. (2000) and Stiglbauer et al. (2002) for descriptions of the German and Austrian data.

Tab. 1: Industry Firm-size Distribution

Firm size	Agriculture and forestry	Mining and utilities	Manufacturing	Construction	Wholesale and retail trade	Hotel and restaurant	Other private services	Banking and insurance
Austria 1998								
<20	65	8	22	35	42	67	55	11
20-100	29	18	25	38	28	23	21	25
101-500	6	28	32	22	20	9	18	33
>500	0	46	22	5	9	2	7	31
West Germany 1995								
<50	85	21	24	66	58	53		22
50-99	8	9	9	13	13	14		12
100-499	6	24	27	17	21	22		31
> 500	1	46	40	4	9	11		35
East Germany 1995								
<50	50	23	47	61	67	50		29
50-99	21	9	14	17	14	12		16
100-499	18	16	27	22	17	22		40
> 500	11	51	12	0	3	17		14
Czech Republic January 1991								
<25	9	4	7	23	44	56	25	7
25-100	29	20	14	20	21	19	21	51
101-500	49	26	34	35	25	14	29	23
>500	13	50	45	22	10	10	25	19
Czech Republic December 1996								
<25	23	12	18	43	67	67	42	22
25-100	31	17	21	24	19	16	21	26
101-500	43	23	29	25	10	11	19	33
>500	3	48	32	8	3	6	18	19
Estonia January 1991								
<20	6	4	4	10	20	20	14	0
20-100	6	15	9	21	26	27	20	100
101-500	50	21	28	39	30	32	34	0
>500	37	60	59	30	25	22	32	0
Estonia March 1995								
<20	33	9	15	21	54	48	28	13
20-100	19	21	22	37	25	29	25	73
101-500	26	19	26	28	15	17	24	7
>500	22	50	37	13	6	6	23	7

7.3. Demographic Reallocation

Given the differences in the transition paths of my two countries, it is natural to ask whether there are differences in the demographic composition of the sectoral reallocation. In Figures 7.9 and 7.10 I plot the share that each demographic group (in terms of gender, age, and education) represents out of total employment (%TOT) and out of new-sector employment (%NEW). The graphs indicate that in both countries, males and younger workers are more likely to participate in the startup firms. Furthermore, the extent to which these workers are more likely to be employed by new firms is similar in the Czech Republic and Estonia. Finally, there appears to be a relationship between education and new-sector participation in that secondary-educated workers are somewhat more likely to work in startup firms. Overall, the data imply little difference in the demographic pattern of the old-to-new reallocation in these two countries, despite their different job destruction policies and unemployment levels.

7.4. Reallocation and Wages

As I discuss above, the difference in the transition paths of my two economies suggests an important role for new-old wage differentials. Our data contain representative information not only on the distribution of jobs but also on the corresponding wages (starting in late 1992 in Estonia). Comparing the relative wage level in the new sector to that in the old sector in Figure 7.11 reveals a similar pattern in both countries: the ratio starts out high and gradually diminishes over time in both countries. While the pattern is similar, the ratio of the average wages in the new to the old sector is always higher in the Czech transition, consistent with my expectations. The lower unemployment level, larger extent of voluntary

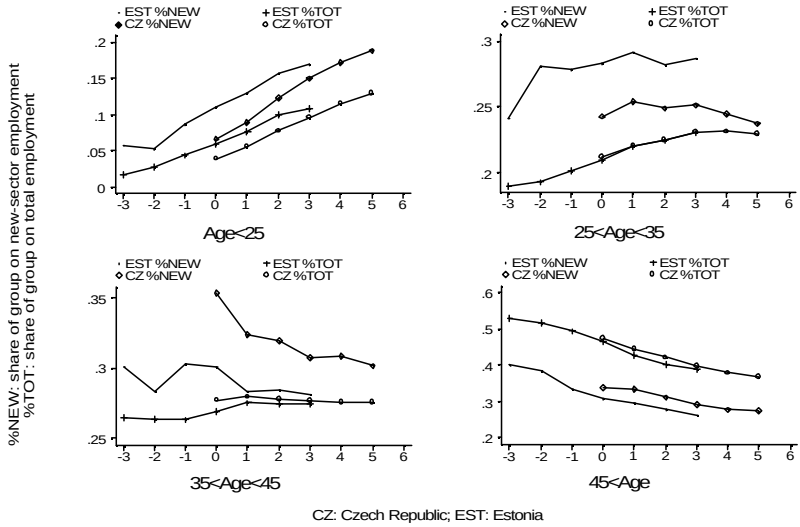

Figure 7.9: Age Composition of Employment.

movement and adequate unemployment insurance may allow for more job search and higher reservation wages in the Czech Republic. Alternatively, employers in the Czech new sector have to offer higher wages to attract workers from the old jobs, which were slow to close down.

While I have an intuition for why the wage gap between the old and new sector is larger in the Czech Republic, it is less clear why the initial wage premium is so large and why it gradually diminishes over the course of transition. One possible explanation for the markup has to do with differences in the productive characteristics of new- vs. old-sector workers. I explore this explanation using simple pooled cross-sectional regressions including a dummy for new-sector jobs and controlling for age, gender, education and firm size. The top panel of Table 2 shows that

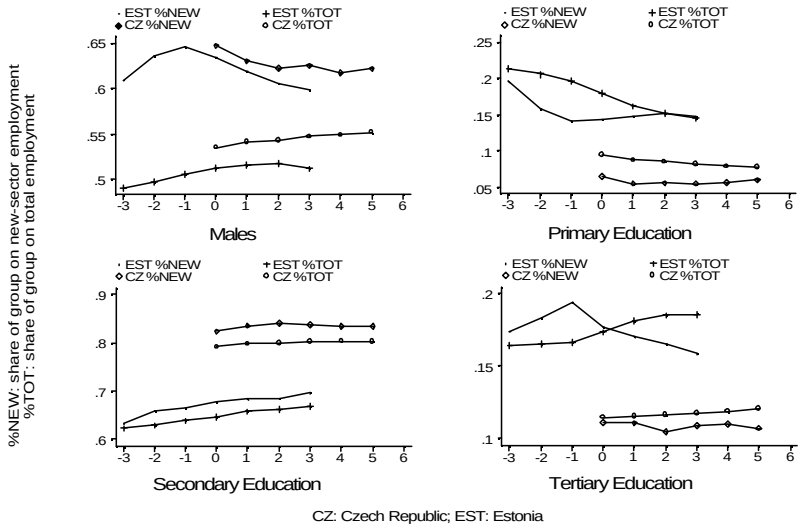

Figure 7.10: Demographic Composition of Employment.

controlling for these characteristics (and imposing the same returns to these characteristics in the new and old sector), the OLS new-sector wage premium for t=1 in each country is about half the size of the unconditional premium. Nevertheless, for both countries, the initial gap remains economically significant and it declines over time, similar to the pattern in Figure 7. Moreover, the premium remains higher in the Czech Republic than in Estonia. Three years into transition, the Czech new-sector wage premium is still almost 15 percent, while there is no significant difference in Estonian wages across the new and old sectors (after correcting for observable worker characteristics and firm size).

What is the source of this conditional wage premium? The large initial markup can be in part due to a self-selection process where those with

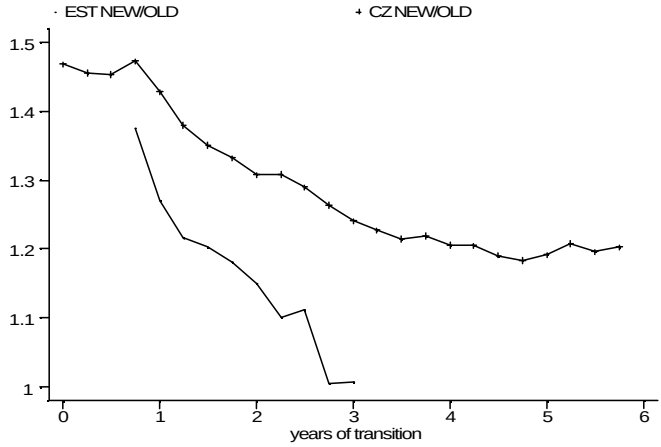

Figure 7.11: Relative Average Wages.

high benefits from moving to a start-up do so first.[63] Alternatively, one may think of this wage markup as a risk premium or as an efficiency wage that induces harder work in new jobs. Why does the new-old wage gap close over time? This could be caused by restructuring and productivity gains in the old sector (as in Aghion and Blanchard 1994) or by competition for workers and increased effort in the old sector (as in Roland and

[63] Such self-selection gains may be largest at the start of transition. One may be interested in comparing the endogenous new-sector dummy coefficient to the average treatment effect of moving a randomly selected worker to the new sector. Estimation of such an effect would require a credible instrument predicting participation in the new sector, but uncorrelated with the benefits from moving. Using an indicator for the worker having been laid off in a mass layoff as an instrument for the new-sector dummy lowers the Czech and Estonian new-sector premium to zero at the start of transition and to large negative values later on. These results are available upon request.

Sekkat 2000). If the initial wage premium has to do with self-selection, its positive effects evaporate over time, especially in Estonia. If the premium arises from the rent received from first-mover advantage (as the new firms entered unfilled niches), the advantage shrinks over time as more firms enter and competition ensues. Alternatively, the risk rent of working for the new sector goes away with transition.

One way of learning about the nature of these wage differences is to study their evolution within industries. In Figure 7.5 I saw across the two countries a differential in the growth of the new sector within industries as well as a differential in the growth of total industry-specific employment. Below I ask whether those differences are reflected in the new-old wage gap. Is the wage premium larger in industries understaffed under central planning, in which the gain from filling market niches is likely to be largest? Does a large wage premium lead to a greater inflow of workers into the given industry, thereby raising the share of the new sector jobs there? Table 2 reports the OLS new-old wage premiums by industrial branch.[64] In the Czech Republic the industry-specific new-old wage gaps are all within one standard error of the economy-wide estimate, suggesting little industry heterogeneity in new-old wage differentials. There is more variability in the Estonian estimates, but the qualitative results are the same in that there appear to be no systematic differences in the new-old wage gap linked to the evolution of industry size or the growth of the new sector within each industry. Instead, wages in the new sector are apparently set in comparison to wages in the old sector in the same industry, no matter whether that industry is growing or shrinking, and the wage markup is the same across industries, irrespective of significant industry

[64] We drop finance because of the small sample size in Estonia.

wage differentials (Munich et al. 2002b). This pattern appears consistent with the efficiency wage explanation for the new-old wage premium.

Tab. 2: New-Sector Wage Premium (OLS Dummy Coefficient)

	Czech Republic			Estonia	
transition year	1	3	6	1	3
Whole Economy	0.256 *	0.157 *	0.144 *	0.17 *	0.040
	(0.031)	(0.02)	(0.019)	(0.032)	(0.034)
R2	0.3	0.33	0.31	0.11	0.15
N	2435	2639	2681	3963	3953
Agriculture and Forestry	0.289 *	0.124	0.107	0.097	-0.046
	(0.09)	(0.09)	(0.086)	(0.1)	(0.068)
R2	0.33	0.31	0.34	0.06	0.11
N	234	184	147	877	620
Manufacturing, Mining & Util.	0.245 *	0.137 *	0.116 *	0.16 *	-0.021
	(0.054)	(0.036)	(0.029)	(0.059)	(0.057)
R2	0.3	0.36	0.34	0.12	0.16
N	1075	1094	1084	1327	1282
Construction	0.185 *	0.161 *	0.086	0.054	0.234
	(0.068)	(0.053)	(0.064)	(0.088)	(0.132)
R2	0.17	0.17	0.14	0.12	0.14
N	243	272	263	370	356
Trade	0.25 *	0.117 *	0.114 *	0.219 *	-0.003
	(0.052)	(0.055)	(0.059)	(0.064)	(0.082)
R2	0.32	0.35	0.32	0.16	0.14
N	293	356	413	554	727
Services , Rest. and Hotel	0.282 *	0.201 *	0.196 *	0.117	0.025
	(0.061)	(0.057)	(0.058)	(0.717)	(0.068)
R2	0.32	0.31	0.33	0.14	0.24
N	362	468	481	693	823

Notes: *denotes significance at 10% level with robust standard errors. All regressions control for firm size and worker age, gender, and education type. Public sector is excluded as well as observations with missing values of the regressors. Data taken from January of each year.

7.5. Low-Wage New-Sector Jobs

Finally, I am interested in the relative quality of the new sector jobs across the two transition paths, and use wage information to infer to what extent the new sector acts as a repository for the unemployed. In the preceding section I have learned about average wage differences across the new and old sectors. Here, I focus on the dispersion of wages. First, is the new-sector wage distribution fatter, especially at the lower end, in Estonia, where unemployment benefits are minimal? Second, using the old sector as a benchmark, does the new sector provide a larger fraction of low-wage jobs in Estonia? Third, how many of the Estonian new-sector workers would prefer to collect unemployment benefits, if they were set at the Czech level?

In Figure 7.12, I present measures of wage dispersion within the new sector.[65] Specifically, I plot the 90-10 log-wage decile difference to present the overall wage dispersion, and the 50-10 log-wage decile difference to capture the relative position of workers at the bottom end of new-sector wage distribution as compared to median workers. Given that unemployment benefits did not provide an effective wage floor in Estonia, it is not surprising to see Estonian new-sector wage dispersion to be much higher than the Czech one. The graph also indicates that a majority of the difference in the level of overall wage dispersion between the two new sectors comes from differences in the lower half of the wage distributions. Furthermore, the time changes in the 90-10 log-wage decile difference in Estonia appear driven by changes in the 50-10 log-wage decile difference.

[65] We use raw wages as the demographic composition of the new sector is similar in the two economies. The wage-dispersion comparison is similar when I work with residuals from Mincerian wage regressions.

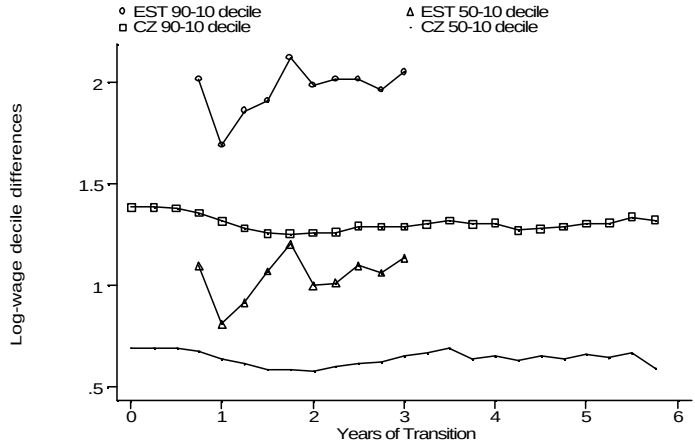

Figure 7.12: Wage Dispersion in the New Sector

Figure 6b plots the fraction of employment in the new sector with wages below the 20^{th} percentile of the wage distribution in the old sector of each economy. In both countries the share of low-paying new-sector jobs (as compared to the old sector) starts below 15 percent and grows over time. This share is indeed higher in Estonia, where it also grows more rapidly than in the Czech Republic. After three years of reforms, more than 20 percent of the new-sector jobs in Estonia were paying less than the 20^{th} percentile of the old-sector wage distribution. In contrast, this fraction remained somewhat less than 20 percent in the Czech Republic until the sixth year of reforms.

Finally, I consider the large difference between replacement ratios of the unemployment insurance system in the two countries and ask which Estonian new-sector jobs are (at the start of employment) paying less than 60 percent (the Czech replacement ratio) of the wage in the previous em-

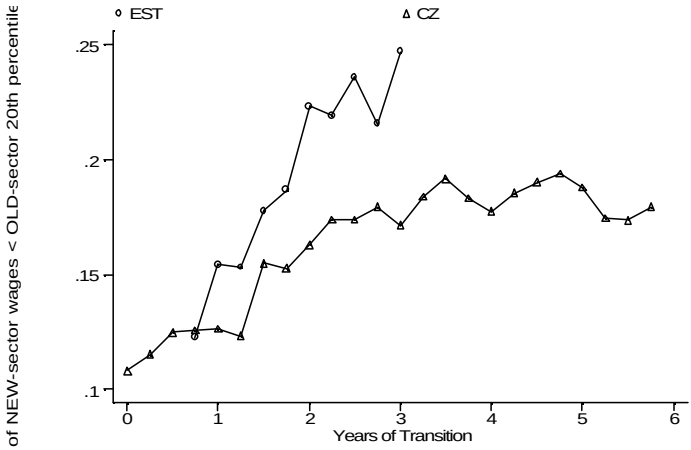

Figure 7.13: Extent of Low-Wage New Jobs

ployment. In 1993-1995, this fraction is between 0.05 and 0.06 in Estonia as compared to 0.02 to 0.035 in the Czech Republic. I thus conclude that while there is more low-wage new-sector employment in Estonia than in the Czech Republic, the extent of this phenomenon is surprisingly small given the near absence of unemployment insurance during early Estonian transition. The growth of productive new jobs in Estonia appears as real as what I see in Czech lands.

7.6. Conclusions

This Section offers stylized facts on the type and sources of start-up job growth in early transition using data from two countries. In particular, I identify patterns of job growth in terms of niches left from central planning. Further, I compare job creation under two different transition paths: one involving drastic job destruction and high unemployment, the other

based on gradual scrapping of old firms. Of course, differences or similarities in outcomes across my two countries can be due to differences in both policies and underlying fundamentals of each economy. While I do not attempt to create counterfactual evidence, I believe a careful descriptive analysis of the two different paths of transition is useful given my lack of knowledge about small-firm new-sector growth.

Given the amount of industrial reallocation needed in post-communist economies that over-employed resources in agriculture and manufacturing, I were surprised to find job growth within industries to be quantitatively more important than job growth due to across-industry reallocation. Furthermore, the within-industry growth of start-ups is similar in the two countries, especially given large differences in capital constraints. I offer convergence to western industry firm-size distributions as an explanation. I also document regularities in wage evolution across new and old firms and suggest that the new jobs were significant contributors to output (as reflected by wage level), rather than stop gap measures to relieve unemployment. Overall, I am struck by the similarities between the two countries in the structure of new-to-old reallocation in terms of industries, demographics, or wages. It appears as if the difference in macroeconomic policies was chiefly manifested on the aggregate level of unemployment and wages, but not in the composition of the new sector.

On the methodological front, my analysis illustrates the usefulness of inexpensive household data for studying structural job change. Not only does worker-level data allow for estimation of job reallocation patterns, one can also use individual wage information to learn about the nature of job reallocation. In future research it would be ideal to combine similar data from a number of countries to estimate the effects that various policies have on the speed and nature of job reallocation and to iden-

tify differences in the reallocation patterns with potential consequences for long-term growth. The path of early transition may affect long-run growth through selection among multiple equilibria, as in Berkowitz and Cooper (1997), or through sclerosis effects from insufficient initial reallocation, as in Caballero and Hammour (2000).

8. Appendix

Table A.1: Macroeconomic Statistics for the Czech Republic and Estonia

		Years since the start of Transition*							
		-2	**-1**	**0**	**1**	**2**	**3**	**4**	**5**
Real GDP Growth [a]	*Czech Republic*	1.4	-1.2	-11.6	-0.5	0.1	2.2	5.9	4.8
	Estonia	-6.5	-13.6	-14.2	-8.8	-2.0	4.6	4.0	10.4
Inflation [b]	*Czech Republic*	1.4	9.7	52.0	11.1	20.8	10.0	9.1	8.8
	Estonia	23.1	211.0	1076.0	89.8	47.7	29.0	23.1	11.2
Real Wages Index [c]	*Czech Republic*	145	136	100	110	114	123	134	146
	Estonia	227	151	100	102	113	119	122	131
Unemployment Rate	*Czech Republic* [d]		0.7	4.1	2.6	3.5	3.2	2.9	3.5
	Estonia [e]	0.5	0.9	2.1	5.8	7.6	9.7	10.0	9.7
Savings (% of GDP) [f]	*Czech Republic*			0.32	0.29	0.32	0.28	0.30	0.29
	Estonia		0.36	0.33	0.22	0.16	0.19	0.16	0.19
Exchange rate [g]	*CZK/USD*			28	28.29	29.16	28.78	26.55	27.14
	EEK/USD				13.23	12.97	11.46	12.03	13.90
Tax Revenue (% of GDP) [h]	*Czech Republic*						42.6	41.9	40.3
	Estonia					35.4	36.1	38.8	40.6
Effective Statutory Social Security Tax (%) [i]	*Czech Republic*					88.2	91.9	91.7	90.8
	Estonia			73.3	84.3	81.2	76.6	81.6	82.9
Budgetary Subsidies to Enterprises (% of GDP) [j]	*Czech Republic*					6.4	7.1	8.3	8.0
	Estonia				1.5	1.4	1.9	0.9	0.3

* The start of transition is 1991 for the Czech Republic and 1992 for Estonia.

Sources:

(a) EBRD Transition Report Update, April 2001 p. 15

(b) EBRD Transition Report, 2000 p. 67

(c) Unicef, (1999) CEE/CIS/Baltics Regional Monitoring Report, 1999. Unicef, Florence. P141

(d) Czech Republic: EBRD Transition Report 2000 and Business Central Europe Database

(e) Estonian Labor Force Survey 1995 (incl. Retrospective) and 1997 (Vodopivec, 2000)

(f) World Development Indicators

(g) Bank of Estonia and Czech National Bank

(h) EBRD Transition Report, November 2001 p. 63

(i) EBRD Transition Report, November 2001 p. 136, 140: Ratio of effective collection of social security taxes over total labor income in the economy, divided by the statutory social security tax rate. A collection of 6 per cent of total payroll for a statut

(j) EBRD Transition Report, November 2001 p. 136, 140: Budgetary transfers to enterprises and households, excluding social transfers. In the Czech Republic this includes transters to Konsolidacni Banka.

Part IV

Assessing the Supply of Tertiary Education

9. Introduction

A large body of empirical literature documents the rise in returns to education occurring during early pro-market reforms in post-soviet economies. However, there is a dearth of descriptive evidence on late-transition pre-EU-accession returns to education. This Chapter fills the gap for the Czech Republic by estimating private wage returns to various education degrees using a large matched employer-employee data set covering salaried employment in the enterprise sector in 2002.

One dimension of the analysis is given particular attention: namely the quantification of the Czech college/high school wage gap. The size of the gap is important for the recent local policy debate on the limited supply of (and excess demand for) college education in the Czech Republic. The country has one of the highest secondary school completion rates in the OECD, but one of the lowest shares of college graduates in the labor force (OECD, 1997). I therefore ask whether the limited supply of college education leads to unusually high returns to having graduated from college.

I provide separate estimates not only for men and women, but also for

different age groups. A separate focus on young employees is motivated by the potentially low substitutability of workers with a given level of education across age groups. (Recall that older Czech workers graduated from communist schools.) Furthermore, public-college enrollment in the Czech Republic increased by approximately 50% during the first transition decade, leading to an increase in the relative supply of college graduates among the labor market inflow. Such higher relative supply may lower the relative price of college degrees on the labor market. Yet, public colleges remain highly oversubscribed.[66] One interpretation of this fact is that the demand for education is "too" high because public colleges are tuition free. An alternative explanation is that the market reward to college degrees is very high. A quantification of the market value of a recent college degree, relative to a high school diploma, is therefore important for shedding light on the binding nature of limited supply of college education in the Czech Republic.[67]

It is important to stress from the start that because I rely on employee data, the estimated returns to education are quite descriptive in their nature. I do not control for sample selection into work for women nor for the selection of both men and women into enterprise-sector salaried employment as opposed to public-sector employment or self-employment (entrepreneurship).

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[66] Every year, only about half of all applicants to Czech public colleges manage to get enrolled (UIV, 1998).

[67] See e.g., Card and Lemieux (2000) for work stressing imperfect substitutability of workers across age groups and changing relative supply of college education across cohorts. Ideally, one would capture time and age effects together with cohort-specific effects. However, this approach is not feasible so far given the few available years of post-communist history.

The Chapter is organized as follows. The next section provides a brief discussion of the existing empirical literature on returns to education in transition economies. It also includes some notes on the Czech educational system. In section 16, I describe the data set, while section 12 reviews the results. Section 13 concludes.

10. Background

The wage rewards of schooling – "returns to education" – are a central concern to both labor economics and econometrics.[68] The topic continues to generate voluminous empirical literature, recently evaluated by Heckman et al. (2003). It is therefore not surprising that wage rewards of education received much attention in post-soviet economies, where they are crucially tied to the growth potential.

Pay differentiation was strictly regimented under central planning, as wages were set according to industry-specific wage grids varying only with the difficulty and "social importance" of the job and with the worker's education and experience (Münich et al., 1999). Since returns to education provide a direct incentive for investment in human capital, it was desirable that pro-market reforms allow for an increase in the returns. Indeed,

[68] Many advances in applied microeconometrics occurred within the "returns" literature. Originally, the literature addressed two major issues: measurement error and ability bias. Currently, there are two competing strategies of estimating returns to education. The first is based on quasi experiments (e.g., Card, 2001). The second estimates more structural models of individual choice, which explicitly allow for human capital heterogeneity and variation in returns across individuals (e.g., Heckman and Vytlacil, 1998). While the first approach is statistically more robust, the second may be closer to estimating policy-relevant (treatment) effects.

wage regulations were quickly abolished at the start of the 1990s and wage dispersion rose rapidly. A Wealth of studies summarized by Svejnar (1999) documents this increase in wage differentiation and suggests that it was in part due to a swift increase in benefits of education.[69]

The Czech Republic was no exception in this regard. Three studies, which investigate changes in the returns to education between communist and post-communist eras in the Czech Republic, report significant increases in the returns. Chase (1997) finds that among men the added income for each year of education approximately doubled between 1984 and 1993 while Flanagan (1995) reports somewhat smaller increases from 3.4 percent for men in 1988 to 4.4 percent in 1993. Finally, Münich et al. (1999) estimate that male returns to a year of schooling increased from 2.7 percent in 1989 to 5.8 percent by the end of 1996. Skill-related wage differentials kept rising even in the mid to late 1990s, albeit at a slower pace (Filer et al., 1999). By 1997, male employee wages increased by up to 9 percent for each year of additional schooling.

There is also evidence comparing returns to specific education degrees across main sectors of the economy: Using 1998 data and focusing on a different issue, Jurajda (2003) reports a 10 percentage points higher college/high school wage gap in the enterprise sector than in the public sector comprising of education, health and public administration.[70]

[69] The literature on early-transition returns to education includes Krueger and Pischke (1995) for East Germany, Rutkowski (1996) for Poland, Orazem and Vodopivec (1997) for Slovenia, Lubyová and Sabirianova (2001) for Slovakia and Russia.

[70] Put differently, the relative difference between the wages of high school graduates with a comprehensive school-leaving examination and the wages of workers with only an elementary education was higher in the enterprise sector than in the public sector. The relative wages of all other education groups, in comparison to wages of elementary

In this Chapter, I extend the existing evidence by covering the situation after the end of the first transition decade and two years before EU entry. As argued in the introductory section, the analysis is important for the ongoing debate about the reform of the tuition-free oversubscribed and under-funded tertiary education in the Czech Republic (World Bank, 2001). Although the structure of the Czech educational system parallels those of other European countries, there is a significant difference in the educational structure of the labor force: While the secondary school completion rate is very high, only a small proportion of Czech workers have completed college.[71] This fact is not surprising given that a major group of secondary-level students attends apprenticeship programs which offer only dismal prospects of continuing on to higher education degrees.

Given these imbalances, the focus of the present study is on the returns to specific education degrees. While Czech elementary (compulsory) and tertiary education is quite similar to those found in other countries, Czech secondary education deserves some explanation. Overall, there are three types of secondary schools in the Czech Republic: vocational, specialized and academic ("gymnasium" in Czech). At the end of all academic secondary schools, most specialized schools and some vocational programs, students pass school-leaving examinations ("maturita" in Czech). These

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education workers, were similar across the two sectors of the economy.

[71] According to OECD (1997), by 1995 about 88 percent of the Czech labor force aged 25 to 64 had completed at least higher secondary school. Only one OECD country had a greater rate of high school completion (the U.S. at 89 percent), while the average across OECD countries was only 65 percent. On the other hand, only 12 percent of the population 25 to 64 had a university degree in 1995, compared to an OECD average of 23 percent. Among OECD countries, only Turkey and Italy (8 percent) and Austria (9 percent) had a lower rate of university completion among the working-age population.

exams approximately correspond to the U.K. General Certificate of Education (GCE) or the German "Abitur" exam. All graduates who pass these comprehensive exams may continue on to colleges, but about two thirds of those who do so typically come from gymnasia. Colleges are publicly funded and typically involve a single-field four to five year track of study.[72]

The preferred categorization of the different education degrees used in the subsequent analysis falls into four groups: (i) elementary education, (ii) apprenticeship without GCE, (iii) all types of secondary education with GCE combined, and (iv) college degrees and higher.[73] One may want to further differentiate types of GCE-awarding secondary schools; these results are available upon request.

11. Data

In the Czech Republic, there are two major worker-level data sets with wage information.[74] First, self-reported wage information is available in

[72] Since 1995 a new type of tertiary school has emerged, partly in response to the excess demand for college education: These so-called higher professional schools typically provide two years of education leading to various specialized diplomas in professional fields. Although these schools are considered tertiary, they operate in the framework of secondary schooling and cannot award Bachelor degrees.

[73] This grouping roughly corresponds to the OECD classification of education levels—the ISCED groups. Category (i) essentially consists of compulsory education and spans ISCED levels 1 and 2. Category (ii) corresponds to ISCED 2 and a small group of workers with ISCED 3C. Category (iii) is identical with ISCED 3A. Finally, the highest category (iv) covers ISCED levels 5 and 6.

[74] Unfortunately, the Czech Labor Force Survey does not ask about wages.

the Mikrocensus household survey for 1988, 1992, and 1996.[75] Second, there is a quarterly national employer survey, called the Information System on Average Earnings (ISAE), in which firms report hourly wages of their employees.[76] In this Chapter, I rely on the second data source from the first quarter of 2002.

The ISAE employer survey was started in the early 1990s based on informal sampling practices. Fortunately, recent data are based on two major updates (in 1998 and 2002) based on stratified random sampling conducted by the Czech Statistical Office in 1996 and 2000 within the Eurostat's Structure of Earnings Survey program. Only firms employing more than 10 workers are sampled. The data include over one third of the entire Czech enterprise employment and cover all firm size categories and industries, except the budgetary sector of health, education, and public administration.[77]

The data include not only the industry, region of operation and ownership type for each firm, but also hourly wages, gender, education, age, and a detailed occupational classification for all employees of the surveyed

[75] This data has been used in analyses of earnings differentiation by Večerník (2001).

[76] The survey is collected by a private agency on behalf of the Czech Ministry of Labor and Social Affairs.

[77] The sample is not perfectly representative of the population of firms. Thus, to recover population statistics as closely as possible, weights reflecting the sampling procedure were calculated by dividing the population frequency of firms within strata cells by the corresponding sample frequency. The population distribution is based on end-of-year firm register, which is compiled by the Czech Statistical Office and which is used as a sampling frame for the survey. The re-weighted data form the basis for the analysis.

enterprises.[78] These wage records are drawn directly from companies' personnel databases using software developed by the data collection agency. Having available a measure of hourly wage rates is ideal for the purpose of estimating returns to education because of the potential differences in hours worked across levels of education. Furthermore, the definition of hourly wage is detailed and fully consistent across firms.[79] The uniformity of the wage definition and the use of personnel records minimizes the extent of reporting errors likely present in household survey data. As with most other data from transition economies, education is reported in ISAE as the highest degree obtained rather than as years of schooling actually attended. Unfortunately, education is missing for 8% of workers and this part of the data is therefore excluded from the analysis. Table 3 contains selected summary statistics and sample-size indicators for the analysis-ready data. There are over eight hundred thousand worker wage records available from over 2000 firms.

Table 3: Weighted Data Means

Variable	Women	Men
Hourly wage (CZK)	74.6	102.4
Age	41.0	41.2
Firm employment	2,325	1,599
Number of workers	321,641	484,126
Number of firms	2,223	2,196

[78] Wage records of top management are excluded from the data.

[79] Each quarter, employers in the Czech Republic are legally required to calculate for each worker an average hourly wage, defined as total cash compensation including bonuses and other special payments divided by total hours worked for that quarter. This average wage is then used for calculating sickness and unemployment benefits.

12. Results

12.1. Educational Structure of Employment and Relative Wages

The structure of enrollment by school type and level has changed significantly since the breakdown of the communist regime; in particular, enrollment in tertiary education has increased by over 50% (UIV, 1998). A simple view of the extent to which this recent development has affected the educational structure of the employee workforce is presented in the top two panels of Table 4. Relative supply of education, which one would expect to be linked to relative wage rewards of education, is presented for each gender and age group separately; this is motivated by the concern that workers with similar education but different age (experience) are not close substitutes.

Several facts stand out in Table 4:[80] (i) Czech employees over 45 have a lower overall level of education, (ii) the educational structure of enterprise employment is stable for workers between 31 and 44 years of age, who are most likely to hold an apprenticeship degree with no GCE, (iii) there has been an overall increase in the level of education for younger female employees, (iv) while the fraction of female employees with at least a college degree has increased for the younger cohorts, young men with tertiary education are relatively less likely to become employees in firms with over 10 workers, which are covered in the ISAE sample. The last finding corroborates earlier evidence from transition economies suggesting that young, well-educated men are most likely to move into the *de novo*

[80] Note that it is rare for one to attain a college degree before 23 years of age in the Czech Republic. Hence, the low fraction of college graduates in the youngest age group.

sector consisting of self-employed and small newly started private firms (see e.g., Jurajda and Terrell, 2003).

Table 4: Educational Structure of Employment and Wages by Education, Gender and Age

Education \ Age in	15-23	24-30	31-37	38-44	45-51	52-61	15-61
Men: % Share of Each Education Category on Age Group							
Primary	9	6	6	6	10	11	8
Apprenticeship, no GCE	60	58	56	56	59	55	57
Secondary with GCE	30	28	26	24	19	23	24
University and higher	1	9	13	14	12	11	11
Women: % Share of Each Education Category on Age Group							
Primary	11	7	9	15	28	26	18
Apprenticeship, no GCE	35	41	44	44	41	37	41
Secondary with GCE	50	43	39	35	27	33	35
University and higher	3	10	8	7	5	4	6
Men: Average Hourly Wage Relative to Secondary Education with GCE							
Primary	0.76	0.69	0.66	0.65	0.59	0.58	0.63
Apprenticeship, no GCE	0.83	0.75	0.71	0.70	0.66	0.65	0.70
Secondary with GCE	1.00	1.00	1.00	1.00	1.00	1.00	1.00
University and higher	1.09	1.51	1.94	1.91	1.81	1.77	1.85
Women: Average Hourly Wage Relative to Secondary Education with GCE							
Primary	0.76	0.66	0.67	0.65	0.63	0.61	0.66
Apprenticeship, no GCE	0.77	0.67	0.69	0.68	0.65	0.64	0.68
Secondary with GCE	1.00	1.00	1.00	1.00	1.00	1.00	1.00
University and higher	1.05	1.57	2.07	1.75	1.83	1.70	1.78
Men: Median Hourly Wage Relative to Secondary Education with GCE							
Primary	0.78	0.74	0.69	0.67	0.65	0.64	0.68
Apprenticeship, no GCE	0.87	0.80	0.77	0.74	0.72	0.71	0.76
Secondary with GCE	1.00	1.00	1.00	1.00	1.00	1.00	1.00
University and higher	1.14	1.34	1.65	1.59	1.58	1.54	1.58
Women: Median Hourly Wage Relative to Secondary Education with GCE							
Primary	0.76	0.71	0.69	0.67	0.67	0.63	0.69
Apprenticeship, no GCE	0.79	0.71	0.72	0.70	0.68	0.67	0.71
Secondary with GCE	1.00	1.00	1.00	1.00	1.00	1.00	1.00
University and higher	1.00	1.46	1.71	1.56	1.60	1.67	1.59

The middle two panels of Table 4 show relative average wages of workers across education levels, conditional only on age and gender. The displayed statistic gives wage levels relative to the average wage of employees with a secondary degree with GCE within each gender and age group. Starting with women in the bottom panel, average wages appear similar for apprentices and employees with only primary education—both groups make on average only about 67% of the hourly wage level of workers with

a GCE. This gap is surprisingly stable for all age groups above 24. Even for male workers, the benefits of an apprenticeship degree, relative to only primary education, appear small at about 5 percentage points.

While not having a GCE lowers hourly wages by about 30 percent, obtaining a college degree leads to wage rates that are nearly two times higher than wages of workers with a secondary education with GCE. The college/high school gap is "only" about 50% for workers aged 24-30, but this is likely driven by differences in experience, as high school graduates have accumulated more productive practice than college graduates of the same age. Finally, it is interesting to note that college/high school wage gaps are remarkably similar across gender.

The bottom two panels of Table 4 present an alternative comparison of relative wages based on medians as opposed to means. This alternative summary statistic is not sensitive to outliers and represents more closely the situation for "typical" workers. As expected, wage differences based on medians are somewhat smaller, but remain substantial. For example, a college educated male worker aged 31-37 whose wage is at least as high as that of half of all other similar workers faces hourly wage rates that are 65% higher than those of a typical worker in the same age category with only a GCE.

How does the Czech college/high school unconditional mean wage gap compare to those found in other countries? Brunello et al. (2000) document the size of the college/high school male wage gap in 10 European economies in the mid to late 1990s using data on workers who are approximately in the 45-51 age group. Their base group of high-school graduates covers upper secondary education (ISCED 3 and 4) and therefore closely corresponds to the definition of secondary education with GCE used in this Chapter. Furthermore, their sample of countries covers Austria and

West Germany, two neighbors of the Czech Republic with a similarly low supply of tertiary education and a strong tradition of vocational education. Brunello et al. (2000) define the college/high school gap as the log of the ratio of average hourly wages and find that this unconditional wage gap varies from a low of 0.28 in Italy to a high of 0.57 in Portugal. It equals 0.41 in West Germany and 0.37 in Austria.

Applying the same scale and focusing on the comparable group of (about 30 thousand available) male employees aged 45-51, the Czech data imply a college/high school wage gap of 0.60, much higher than most EU figures and even somewhat above the high level of Portugal. In particular, the Czech gap is about 50% higher than those of both Germany and Austria. Given that the gap is even higher for Czech workers aged 31-44, I therefore conclude that the returns to college degrees on the Czech labor market are extremely high in the West European context.

12.2. Mincerian Returns to Education

In this section, I estimate extended Mincerian log-wage regressions. First, I condition on education together with worker potential experience and its square.[81] Second, I additionally control for an extended set of firm characteristics including region of location, two digit industry, ownership type and a quadratic in firm size. The purpose of this exercise is twofold: (i) to estimate the widely used and comparable return to an additional

[81] Potential experience equals age minus 6 minus imputed years of schooling. For women, this measure overestimates the actual years of experience depending on the number of children and length of maternity leaves.

year of schooling, often referred to as "benefits of education",[82] and (ii) to check for the sensitivity of the benefits of education to the potential education-related differences in worker employment patterns across firm types.

Table 5: Estimated Mincerian Returns to Education in 2002

Gender	Men	Women	Men	Women
Age group	15-61	15-61	15-61	15-61
Years of schooling	0.111	0.089	0.103	0.077
	(0.003)	(0.003)	(0.002)	(0.003)
Returns relative to secondary education with GCE				
Primary education	-0.407	-0.393	-0.378	-0.351
	(0.017)	(0.014)	(0.013)	(0.012)
Apprenticeship, no GCE	-0.302	-0.357	-0.263	-0.284
	(0.010)	(0.012)	(0.007)	(0.010)
University education	0.500	0.498	0.494	0.454
	(0.016)	(0.026)	(0.015)	(0.022)
Control variables				
Experience and its square	Yes	Yes	Yes	Yes
Firm controls	No	No	Yes	Yes

Note: All OLS coefficient estimates are highly statistically significant based on standard errors (in parentheses) allowing for clustering of unobservables within firms. Firm control variables are total employment and its square, industry, ownership and r

Table 5 reports these results, namely the coefficients on education variables in log-wage regression equations.[83] The top panel of the table

[82] Technically, they represent only the private economic benefits to education, while private returns would also reflect the private costs of education. Social returns to education would then incorporate various education externalities.

[83] The reported standard errors are robust to unconditional heteroscedasticity as well as to interdependence of error terms across workers of the same firm. See Jurajda (2003) for details.

reports the returns to an additional year of schooling based on years of schooling data imputed from the education degree using typical years of study.[84] The bottom panel shows the results of a separate estimation conditioning on a set of dummy variables for the highest degree obtained, with secondary education with GCE serving as the reference group.

The first two columns of Table 5 show parameter estimates from regressions where the only additional control variable is worker experience and its square. The results imply that wages of male (female) employees in the Czech Republic increase by about 11 (9) percent with each additional year of schooling. Comparing these estimates to those in the last two columns of Table 5, where I additionally control for many firm characteristics, suggests that these returns to schooling are not very sensitive to conditioning on employment patterns. Put differently, workers with relatively many years of schooling are only somewhat more likely to work in firms, industries and regions where wages are higher for all types of workers.

[84] These estimates are subject to measurement error to the extent that students switch programs, repeat years of study or, alternatively, take unusually few years to complete a given degree. Münich et al. (1999) are able to compare estimates based on imputed years of schooling to those calculated off reported years in school. They find that the imputation-based Czech returns to education in 1996 are 0.8 percentage points higher than the correct estimates.

Table 6: Estimated Mincerian Returns to Education by Age

Gender	Both	Both	Both	Both	Both
Age Group	24-30	31-37	38-44	45-51	52-61
Years of Schooling	0.090	0.105	0.100	0.087	0.087
	(0.004)	(0.004)	(0.003)	(0.002)	(0.002)
Returns relative to secondary education with GCE					
Primary education	-0.316	-0.362	-0.395	-0.405	-0.407
	(0.020)	(0.022)	(0.016)	(0.012)	(0.012)
Apprenticeship, no GCE	-0.210	-0.243	-0.282	-0.315	-0.343
	(0.011)	(0.009)	(0.010)	(0.009)	(0.009)
University education	0.448	0.535	0.511	0.468	0.431
	(0.026)	(0.027)	(0.025)	(0.024)	(0.021)

Note: All firm and worker control variables are included. See Table 3 for more notes.

Examining the impact of specific degrees in the bottom panel of Table 5, it is clear that educational structure is a major determinant of wages even after controlling for other explanatory characteristics. Education degrees alone explain over 30 percent of the variation in raw wages. The estimated coefficients do not move by more than 4 percentage points when additional firm characteristics are accounted for, with the exception of the female dummy for apprenticeship degree.[85] The benefits of specific degrees are also quite similar across gender, even after conditioning on other explanatory variables.

Next, Table 6 lists the estimated returns to education for each age group, combining male and female workers and conditioning on the extended set of regressors. The returns to years of schooling vary relatively little over age categories. The age trends in the estimated conditional returns to specific degrees (as compared to secondary education) are similar to those in the unconditional gaps in Table 4. Note that after imposing

[85] The estimated returns are not overly sensitive to the weighting scheme either.

the same returns to experience for workers of all types of education, the returns to college are relatively higher for the young age group in Table 5.

Finally, I compare simple specifications of the returns to education degrees across 1998, 2000 and 2002. The structure and size of the 2000 data is similar to that of the 2002 sample. The 1998 data is described in Jurajda (2003); in comparison with the most recent data, the enterprise sector sample from 1998 contains only about one half of the 2002 firms and is less representative of the entire economy. The results presented in Table 7 imply that the education-related wage differentials have been constant over the 2000-2002 period. The 1998-2002 comparison suggests a large increase in the college/high school wage gap as well as a reduction in the penalty for not having any secondary education. However, given the low comparability of the data over time, I hesitate to draw strong conclusions.

Table 7: Estimated Returns to Education over Time

Year	1998	2000	2002
Returns Relative to Secondary Education with GCE			
Primary education	-0.427	-0.370	-0.360
	(0.015)	(0.009)	(0.010)
Apprenticeship, no GCE	-0.271	-0.279	-0.272
	(0.013)	(0.008)	(0.006)
University education	0.409	0.481	0.482
	(0.030)	(0.020)	(0.014)

Note: The estimates are based on all workers and condition on all controls and the female dummy. For more notes see Table 3.

13. Conclusions

In this Chapter, Czech returns to years of schooling and to specific education degrees are estimated using 2002 data on hourly wages of salaried employees. The return to education is close to 10%, which is relatively high. Furthermore, the college/high school wage gap is much higher than those found in the EU economies. In particular, it is about 50% higher than comparable gaps in Austria or Germany, both of which have relatively similar educational systems and enrollment patterns. There is also some evidence that the gap has increased between 1998 and 2002. These findings are consistent with the interpretation that the continuing dramatic oversubscription of Czech public colleges is due to insufficient supply (lack of funding) and not to low cost (tuition-free). The short supply of college education apparently 'bites' on the Czech labor market.

Earlier estimates of returns to education (Filer et al., 1999) based on mid-transition data already implied that the Czech returns to education have increased to a high level relative to the level of development (Psacharopoulos, 1994). One explanation for this fact is that one year of communist schooling supplies relatively less human capital. However, the analysis presented in this Chapter shows that returns are similarly high even for workers who were 11 to 17 at the time of the breakdown of communism. These findings are consistent with the presence of high demand for educated workers, driven perhaps by skill-biased technological change (Katz and Author, 1999), combined with the traditionally limited supply of tertiary education.[86]

[86] One would expect that in the long run a country's technology reflects its relative endowment abundance, including the educational structure of the labor force. It would therefore be natural to expect the Czech economy to operate more vocational

The economic costs of having relatively few college-educated workers are potentially large and diverse. Today, the country is less likely to attract high-value-added foreign direct investment that requires an abundant college-educated labor force. Tomorrow, the gains from technological innovations will be smaller. Finally, EU accession will open EU universities to Czech students on an equal-access basis. Those who are unable to get enrolled in local tertiary education are likely to do so abroad. To the extent that these future EU-based students will be unlikely to return to the Czech Republic upon graduation, the insufficient supply of college education may result in a brain drain.

education-intensive blue-collar technology. Still, the emergence of IT and other "skill-biased" technologies may reinforce the relative lack of a highly educated labor force on the Czech labor market.

Part V

Gender Wage Gap and Segregation

14. Introduction

The legislation of most transition economies (TEs) has long included fundamental clauses about equality of men and women. Until recently, however, western-style anti-discrimination labor market policies were either not introduced or enforced.[87] Since one of the pre-requisites of accession to the European Union is harmonization of legislation, many TEs, including the Czech Republic and Slovakia, are now in the process of enacting policies of comparable worth, equal pay, and equal employment opportunity.[88]

Each of these anti-discrimination policies affects a different source of

[87] The constitutions of TEs typically include a "no discrimination in remuneration" clause and in some countries, e.g. Ukraine, Estonia, and Hungary, the Labor Law guarantees "equality of labor rights." However, these rights are not specified in detail and not enforced in courts. For example, until recently Czech employers stated gender requirements when posting hiring ads.

[88] This harmonization of legislation is a natural component of economic convergence. See, e.g., Kočenda (2001) who shows that common institutional features correlate with macroeconomic convergence among the pre-accession countries. The anti-discrimination amendments of the Labor Code and Wage Law were legally enacted in 2000 in the Czech Republic and in 2002 in Slovakia.

the overall wage gap between men and women. The comparable worth policy attempts to equalize wage rates across occupations and job cells of equal worth, where a job cell is defined as a group of workers with the same occupation within a firm and "worth" is defined in terms of the job's skill requirements and other attributes. The equal pay provisions target wage differences within job cells. Finally, the equal employment opportunity clauses affect all forms of segregation–the discriminatory hiring, firing, and promotion practices that result in high concentration of women in low-paying occupations, firms, or job cells. Which of the anti-discrimination policies is the most important in narrowing the gender wage gap therefore depends on the relative size of the gap's elements.

How much do I know about the composition of the wage gap in late transition? There is a Wealth of research studying the evolution of gender-specific wages during early transition when wage differentiation increased dramatically and when labor force participation rates decreased from the artificial high levels of the communist era. With one exception, however, this research did not focus on the effects of occupational segregation, and no evidence exists on the contribution to the wage gap of within-establishment and job-cell segregation.[89] Furthermore, little evidence exists beyond the early transition years. A recent detailed quantification of the sources of the wage gap is therefore needed to help guide the enforcement of the newly introduced anti-discrimination policies in TEs. In particular, to combat the segregation-related gender pay gap, it is crucial to understand whether it arises within or across firms.

To provide such guidance, this Chapter decomposes the late-transition

[89] The exception is Ogloblin (1999) who analyzes occupational segregation in Russia. See Section 2.

gender wage gap into its parts attributable to detailed forms of gender segregation and to violations of the equal pay act. The analysis is based on matched employer-employee data sets including hourly wage records of almost 1 million Czech and Slovak workers in 1998. The late-transition wage structure is described using Mincerian wage regressions conditioning not only on gender and other personal and firm characteristics, but also on segregation measures consisting of the fraction of women employed within a given occupation, establishment or job cell. The estimated coefficients are used together with the mean differences in explanatory variables by gender to calculate a Oaxaca-Blinder mean wage gap decomposition. The regression estimates account for the clustering of regression residuals by firms and for coefficient heterogeneity across sample strata.

In addition, the present study offers separate findings for the unregulated enterprise sector consisting of private and state-owned firms and for the budgetary public sector (education, health, and public administration), where wages are funded from the state budget and set according to wage grids specified by the government administration. Such sectoral comparison is interesting for at least three reasons. First, wage setting mechanisms differ across sectors and one may expect that different policies are appropriate to fight the gender wage gap in each sector. Second, labor market administration can implement the anti-discrimination policies more easily in the budgetary public sector, which is fully regulated. Third, it is well known that the public sector is a major employer of women and that wages in the public sector are lower than in the enterprise sector. Hence, it is interesting to ask to what extent the economy-wide gender wage gap is driven by employment and remuneration patterns across the public and non-public sectors.

To my knowledge this is the first analysis of the gender wage gap in

transition countries using a matched employer-employee data set, capturing within-establishment segregation effects, and clearly differentiating between public and enterprise wage setting. This Chapter identifies the channels by which segregation affects gender wage differences; it is not geared towards identifying the causes of segregation. The results lead to policy implications and can be used to hypothesize about the determinants of cross-country differences in gender wage gap and segregation in transition.

15. Background and Previous Literature

15.1. Gender Wage Gap in Transition

The equality of men and women was one of the proclaimed advantages of the communist system. The "full employment" policy stipulated that all able-bodied individuals had to (go to) work and wages and prices were set so that only one income per family meant near poverty. Most women had full access to education and health care, but they also had to work.[90] As many other "rights" imposed under central planning, the right to gender equality resulted in what has been sometimes termed an "allergy to feminism." See Ogloblin (1999) and Brainerd (2000), who provide a detailed discussion of the relevant institutional background on gender in communism.

[90] Labor force participation rates were artificially high for both sexes under central planning and declined during early transition. The decline was somewhat faster for women than for men (see Ham et al., 1999, and the references therein). In 1998, the Czech (Slovak) participation rate for ages 15-64 was 80 (73) percent for men and 64 (60) percent for women.

In accordance with the propaganda of gender equality, pay differentiation based on gender was officially restricted under central planning: Wages were set according to industry-specific wage grids varying only with the difficulty of the job and with the worker's education and experience, not gender (Münich et al., 1999). Yet, gender wage gaps were substantial in communism, especially in the context of low wage dispersion (Atkinson and Micklewright, 1992). In 1988, women in communist Czechoslovakia earned on average about 70 percent of men's wages (Ham et al., 1995) and these differences are generally attributed to discriminatory promotion practices and to the segregation of women into low-paying occupations.

Following the collapse of communism, wage regulations were quickly abolished and a Wealth of studies summarized by Svejnar (1999) documents a rapid increase in wage dispersion during transition, underlined in part by increases in returns to education. Skill-related wage differentials kept rising even in the mid to late 1990s, but the process seems to have converged to a relatively stable wage structure at least in the Czech Republic and Slovakia (Filer et al., 1999). Today, wage grids, restraining gender pay differentiation, are used only in the budgetary sector (education, health, and public administration), and room for pay discrimination is open in the unregulated enterprise sector.

The literature investigating the wage position of women in transition is rapidly growing. Most of the existing work, however, studies the impact of early pro-market reforms on relative female wages. See, e.g., Orazem and Vodopivec (1995) for Slovenia, Hunt (2002) for East Germany, and Newell and Reilly (1996), Brainerd (1998), Ogloblin (1999) and Reilly (1999) for Russia. Brainerd (2000) contrasts female relative wages under communism and early-reform in seven TEs. She shows that during early transition the gender wage gap diminished in Eastern Europe but widened

in Russia and Ukraine due to dramatic increases in wage dispersion there. On the other hand, Newell and Reilly (2000), relying on mid-transition data, suggest that the gender wage gap has been relatively stable through the 1990s in a number of TEs.

Ogloblin's 1999 study is closely related to the present research in its attempt to capture the effect of occupational segregation on wages. Using a nationally representative Russian household survey from 1994-1996, he finds, similar to Newell and Reilly (1996), that the gender pay gap cannot be explained by gender differences in education and experience alone. Ogloblin then further conditions on industry and firm ownership dummies as well as on a class of occupational dummies, capturing overwhelmingly "male" and "female" occupations. He finds that these additional controls account for over 80% of the wage gap and singles out occupational segregation, a legacy of the Soviet era, as the most important determinant of gender earnings differentials in transition Russia. Due to the uniformity of labor market practice across the former communist countries, one may expect segregation to have a sizeable effect on gender wage differences in other TEs as well.

This study therefore extends the existing research by offering new evidence on sex segregation and pay gap in Central Europe. Furthermore, this Chapter is the first within the transition literature to measure the effects of within-establishment forms of workplace segregation.

15.2. Segregation and Wages

There is a strand of both theoretical and empirical research on the relationship between gender segregation and pay gap. The empirical work has been mainly based on U.S. data. In particular, occupational segrega-

tion has been the subject of much research, e.g. Killingsworth (1990) and Macpherson and Hirsh (1995), which finds that not only female, but also male wages are lower in predominantly female occupations. Johnson and Solon (1986) suggest that employer segregation in the U.S. may be more important than occupational segregation, implying that the comparable worth policy applied within firms has little effect. Further, Blau (1977) and Bielby and Baron (1984) point to the presence of significant job-cell segregation.[91]

Matched employer-employee data-sets now allow researchers to simultaneously condition on the extent of all of these types of gender segregation when estimating the effect of gender on wages. See Groshen (1991), Carrington and Troske (1998), and Bayard et al. (in press) for analysis of such data from the U.S. The results of the last study, based on a large data set covering all industries and occupations, suggest that both the effect of the individual's sex within a job cell and various forms of gender segregation are important in accounting for the total U.S. gender pay gap.

The present Chapter relies on the empirical approach applied in this recent U.S. cross-sectional literature (see Section 17). It is important to note that these studies work with extensive samples of employed workers and do not control for occupation or firm taste differences across gender, which is important for the interpretation of the estimated segregation effects. Employer discrimination in hiring and promotion is only one of the potential causes of sex segregation. Segregation may also arise as a result of human capital differences or from differences in school inputs. Alternatively, women may concentrate in certain occupations due to social norms

[91] A recent survey of the gender-related economic literature is provided in Altonji and Blank (1999).

or due to differences in job tastes.[92] Macpherson and Hirsh (1995) explore the causes of occupational segregation using longitudinal U.S. data. They account for most of the wage effect of occupational gender segregation by conditioning on skill-related occupational characteristics and unmeasured skill or taste differences of workers; hence, they imply that the relative proportion of female employment in an occupation reflects these characteristics and taste differences and should not be of major policy concern in the U.S.

directly testing for the various causes of segregation in transition goes beyond the scope of the present Chapter. Nevertheless, the research on segregation in communism, surveyed, e.g., in Ogloblin (1999), blames occupational segregation there on communist policies treating women as a "specific labor force" and institutionalizing gender segregation. Much of this legacy of communism remains visible in today's transition labor markets, e.g., the overwhelming fraction of female employees in the budgetary sector (see Section 18). To the extent that gender segregation is the outcome of central planning, it is less likely than in the U.S. that it reflects worker taste differences and unmeasured skills. Furthermore, the discrimination interpretation of segregation is also supported by 1993 enterprise surveys sponsored by the International Labor Organization (Paukert, 1995). The surveyed Czech and Slovak employers openly and strongly preferred men to women in many occupational classes, including not only maintenance and repair (with over 90 percent preference for men, no preference for women), but also in professional, administrative, and service occupations (36 to 58 percent preference for men, below 10 percent for

[92] For a thorough discussion of the potential channels that relate segregation and gender wage gap see, e.g., England (1992) or Anker (1997).

women). Hence, my preferred interpretation of the effect of segregation on wages in post-communist countries is that based on a legacy of employer discrimination, not on endogenous job selection.[93]

16. Data

The data come from national employer surveys, called Information System on Average Earnings (ISAE), in which firms report hourly wages of their employees.[94] (Both countries also conduct household surveys of individuals, but these Labor Force Surveys do not ask about wages.) For each firm, the data includes the industry of operation and the firm's ownership type (private, state, foreign, or mixed), while the region of operation is recorded separately for each establishment of a multi-unit firm. Only firms with more than 10 employees are covered in the sample. Participating firms report hourly wages, gender, education, age, and a detailed occupational classification (based on the International Standard Classification of Occupations 1988) for all workers they employ except top management. The data records are drawn directly from companies' personnel databases using software developed by the data-collection agencies. Having available a measure of hourly wage rates is ideal for the purpose

[93] Communist societies were tied with omnipresent social norms. Distinguishing between differences in gender-specific job preferences and those affected by social norms and cultural stereotypes is hard (Anker, 1997).

[94] The surveys, included by the Czech and Slovak Statistical Offices among the national obligatory inquiries, are collected by a private agency on behalf of the Czech Ministry of Labor and Social Affairs and the Slovak Ministry of Labor, Social Affairs and Family. They are compatible with the European Earnings Cost Index and are coordinated by the European Statistical Office.

of estimating differences in the pay of men and women because of the gender differences in hours worked. Furthermore, the definition of hourly wage is detailed and fully consistent across firms.[95] The uniformity of the wage definition and the use of personnel records, minimizing the extent of reporting errors, make the data unique at least in the transition context.

The data obtained for the analysis consists of employees from participating firms from the first quarter of 1998 for the Czech Republic and a randomly drawn one-in-three sub-sample of employees from Slovak firms from the third quarter of 1998. The original ISAE samples from this period cover approximately 35 and 22% of the entire Czech and Slovak enterprise employment respectively. In the Czech Republic, the sample includes 1614 firms and establishments, which form a total of 999 firms, some multi-unit. In the Slovak sample, there are 658 firms, consisting of 735 firms and their establishments.[96]

Participating firms were drawn randomly within sampling strata, defined by the product of an industry classification and employment-size categories. However, the strata-specific population coverage, defined as the ratio of the number of sampled establishments to the number of establishments in the economy within a given sampling strata, is the result of a number of discretionary decisions on the part of the data collection agencies. Collection of this data began in 1993 when the sample contained a few large firms. The samples were gradually enlarged in each country

[95] Each quarter, employers in the Czech and Slovak Republics are legally required to calculate for each worker an average hourly wage, defined as total cash compensation including bonuses and other special payments divided by total hours worked for that quarter. This average wage is then used for calculating sickness and unemployment benefits.

[96] A majority of the establishments belong to a few large public or state-owned firms.

by random sampling in strata where coverage was relatively low. This is far from an ideal sampling strategy. It under-represents newly born firms and does not fully correspond to modern probability sampling procedures. The resulting samples lack representativeness with respect to both sampling criteria: the industrial structure and size. The composition of the data is weighted toward large establishments and manufacturing industries, similar to the matched employer-employee data used by Bayard et al. (in press).[97] The data covers, however, essentially all industries and occupations in both countries. The ISAE samples not only provide the only source of recent wage information in the Czech Republic and Slovakia, but to my knowledge, they are also the only matched employer-employee data from any transition country.

To recover population statistics as closely as possible, weights reflecting the sampling procedure were calculated by dividing the population frequency of firms within strata cells by the corresponding sample frequency.[98] The population distribution is based on end-of-year firm registers, which are compiled by the Statistical Offices of each country and contain summary information on all existing firms in the economy.[99] The firm registers are also used as sampling frames by the data collection agen-

[97] See Abowd and Kramarz (1999) for a survey of matched employer-employee data sets.

[98] For Slovakia, I also had access to population employment figures by strata. Weights based on strata employment were fully comparable, however, to weights based on the strata-specific number of firms. For the Czech Republic, only the firm frequencies are available; therefore, I use the firm-level weights in both countries.

[99] For the Czech Republic, I use the 1997 register to approximate the population of firms in the first quarter of 1998. For Slovakia, the 1998 register is used to approximate the 3rd quarter 1998 population.

cies. Unfortunately, the registers appear to be of problematic quality for the smallest firm-size categories. (Revised statistics are often published with significant delay, which differ greatly from the originally published results.) Further, the ISAE samples include only a very small fraction of existing firms with fewer than 100 employees. The analysis is therefore based on a sample of firms employing more than 100 workers, containing 726,635 workers in 663 Czech firms and 112,698 workers in 443 Slovak firms.

Much of the analysis conditions on the workers' attained education level,[100] which is However missing for a large fraction of workers (25% in Czech and 12% in Slovak data). Education has therefore been imputed based on the in-sample information. Five broad educational attainment categories were formed and the most frequent value for those workers reporting education within 4-digit occupational categories has been assigned as the predicted value separately for each sex and country. The gender mean wage differences by education degree based on either the reported or the imputed measure of education are in most cases almost identical.

Weighting in most cases lowers the mean wage estimate as more weight is given to smaller firms, which pay lower wages. The average hourly wage in the Czech non-public sector decreases by about 6 Czech Crowns (CZK) for both sexes as a result of weighting. The effect is smaller in the Czech public sector and Slovak non-public sector and is actually reversed for public wages in Slovakia, where coverage is much lower than elsewhere.

[100] As with most other data from transition economies, education is reported as the highest degree obtained rather than as years of schooling actually attended. See Filer et al. (1999) for a brief description of the Czech and Slovak educational system and its several paths that students may follow.

Except for firm total employment, which corresponds to one of the weighting dimensions, other variables are little affected by weighting.

17. Estimation Approach

A vast literature aimed at measuring the extent of wage discrimination has followed Oaxaca (1973) in decomposing the overall mean wage difference between the advantaged (men) and disadvantaged (women) into two parts: the first reflecting the difference in average productive endowments of individuals in each group and the second part due to the differences in coefficients. Following this approach, one first estimates logarithmic wage regressions separately for each gender, controlling for explanatory variables. The decomposition technique relies on the fact that the fitted regressions pass through the sample means as follows:

$$\overline{\ln w_g} = \widehat{\beta_g}' \overline{X_g}, \quad g \in \{f, m\}, \tag{17.1}$$

where f denotes females and m denotes males, $\overline{\ln w_g}$ is the gender-specific mean of the natural logarithm of hourly wage, and where $\overline{X_g}$ represents the respective vectors of mean values of explanatory variables for men and women. Finally, $\widehat{\beta_m}$ and $\widehat{\beta_f}$ are the corresponding vectors of estimated coefficients. A general form of the mean wage decomposition is as follows:

$$\overline{\ln w_m} - \overline{\ln w_f} = (\overline{X_m} - \overline{X_f})' \widetilde{\beta} + [\overline{X_m}' (\widehat{\beta_m} - \widetilde{\beta}) + \overline{X_f}' (\widetilde{\beta} - \widehat{\beta_f})], \tag{17.2}$$

where $\widetilde{\beta}$ represents a counter-factual non-discriminatory wage structure. The first term on the right hand side of equation 17.2 represents that part of the total logarithmic wage difference which stems from the difference in average productive characteristics across gender. The second term originates in the differences in gender-specific coefficients from the non-

discriminatory wage structure and is often interpreted as reflecting wage discrimination.[101]

There are a number of variants of this method depending on how one simulates the non-discriminatory wage structure $\widetilde{\beta}$. Neumark (1988) and Oaxaca and Ransom (1994) suggest the use of regression coefficients based on pooled data including both men and women, arguing that they provide a good estimate of a competitive non-discriminatory norm.[102] Alternatively, one can use a similar approximation based on weighting the male and female coefficients with sample proportions of each sex (Macpherson and Hirsh, 1995).

I follow the suggestion of Oaxaca and Ransom (1994) and rely on pooled-data coefficients. Further, I follow Groshen (1991) and Bayard et al. (in press) and present my initial analysis using pooled-data regressions where the unexplained part in equation 17.2 is presented using a female dummy coefficient:

$$\overline{\ln w_m} - \overline{\ln w_f} = (\overline{X_m} - \overline{X_f})'\beta + \alpha F. \tag{17.3}$$

To check for the sensitivity of the results to using this approach, I also estimate the gender-specific coefficients (as in Oaxaca, 1973) for the preferred specification. The wage gap decomposition I obtain using the gender-

[101] There have been objections to this decomposition approach. First, by focusing on the mean gap, it ignores meaningful differences in gender-specific wage distributions. Second, if characteristics which might differ between males and females are omitted in the vector of regressors, the contribution of these characteristics will be captured by the constant term and will erroneously appear in the measure of discrimination.

[102] Neumark (1988) provides a theoretical justification for this approach using a model of discrimination with many types of labor where employers care about the proportion of women they employ.

specific coefficients is not materially different from that based on the above approach (see Section 18.3). Furthermore, note that while the gender-specific coefficients are interesting to compare, the equal-employment-opportunity anti-segregation policy aims at equalizing the gender employment patterns captured in X. Equation 17.3 therefore provides guidance for policy purposes: (i) it uses pooled-data coefficients to quantify the parts of the wage gap explained by various variables including sex segregation, and (ii) it measures the unexplained portion of the gap, presenting an upper limit on within-workplace 'pure' gender wage discrimination, which is the target of the equal-pay policy.

The conditioning set X includes observed worker and firm specific characteristics (denoted by Z). Next, the effect of gender segregation on wages is captured by the "femaleness" of occupations, establishments, and job cells. "Femaleness" is measured by the percent of females (denoted by P) in a given group of employees: the elements of the P vector are the fraction of female employment in the worker's occupation, firm, and job cell.

I therefore estimate wage regressions of the following form:

$$\ln w_{ij} = \alpha F_{ij} + Z_{ij}^{'}\delta + P_{ij}^{'}\gamma + \epsilon_{ij}, \text{ with } i = 1, ...N_j, \text{ and } j = 1, ..., J, \tag{17.4}$$

where w_{ij} denotes the hourly wage of the i-th worker in the j-th firm, and where $F_{ij} = 1$ if the worker is female and equals 0 otherwise. P_{ij} is the vector of the "femaleness" measures for the given worker, J denotes the number of firms in the sample and N_j is the number of workers in the j-th firm.

The specific nature of the sampling procedure discussed in Section 16 results in a lack of representativeness of the ISAE data across strata.

For instance, small firms, which typically pay lower wages, are relatively under-represented in the samples. To the extent that wage setting differs across strata, this lack of representativeness should be reflected in calculating mean wages (and mean wage differences between men and women) by properly re-weighting means from each strata. Weighting in regression, however, is a controversial topic.[103] Under the assumption that regression coefficients are identical across strata, both OLS and WLS (Weighted least squares) estimators are consistent, and OLS is efficient. If the parameter vectors differ for each sampling strata $s = 1, ..., S$ so that $\beta_s \neq \beta$, where $\beta' \equiv (\alpha, \delta', \gamma')$ from equation 17.4, a regression slope estimator analogous to the mean estimator is a Weighted average of strata-specific regression estimates:

$$\widehat{\beta} = \sum_{s=1}^{S} W_s \widehat{\beta}_s, \qquad \widehat{V}(\widehat{\beta}) = \sum_{s=1}^{S} W_s^2 \widehat{V}(\widehat{\beta}_s), \tag{17.5}$$

where $W_s = n^{-1} n_s$ are Weights reflecting the population shares of employees in each strata,[104] and where $\widehat{\beta}_s$ is an OLS estimate based on observations from stratum s.

In contrast, the WLS procedure applied to pooled data from all strata

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[103] The following discussion relies heavily on Deaton (1997, pp. 67-72).

[104] The population counts of employees by strata are not available for the ISAE data and they have to be constructed from the population number of firms by strata, N_s. Denoting the sample values of the strata-specific number of firms and employees as $\widetilde{N_s}$ and $\widetilde{n_s}$ respectively, I estimate the population counts as $\widehat{n_s} = \left(\widetilde{N_s}\right)^{-1} N_s \widetilde{n_s}$ and $\widehat{n} = \sum_s \widehat{n_s}$.

results in an estimator $\widehat{\beta}_{WLS}$,

$$\widehat{\beta}_{WLS} = \left(\sum_{s=1}^{S} \widetilde{W}_s X_s' X_s\right)^{-1} \sum_{s=1}^{S} \widetilde{W}_s X_s' \ln w_s = \left(\sum_{s=1}^{S} \widetilde{W}_s X_s' X_s\right)^{-1} \sum_{s=1}^{S} \widetilde{W}_s X_s' X_s \widehat{\beta}_s, \tag{17.6}$$

which is in general not consistent for the Weighted average of the strata parameters β. Here, $\widetilde{W}_s = (\widetilde{n_s})^{-1} n_s$, where $\widetilde{n_s}$ represents the sample values of the strata-specific number of employees, X_s is the data matrix for stratum s conformable to the definition of β given above, and $\ln w_s$ is the column vector of $\ln w_{ij}$ for $i, j \in s$. Note that the WLS regression Weights the strata-specific coefficient $\widehat{\beta}_s$ not only by $\widetilde{W}_s$, but also by matrix Weights $X_s' X_s$ corresponding to the precision of $\widehat{\beta}_s$. The WLS estimator is consistent for β if the parameter variation across strata is independent of the moment matrices and if the number of strata is large (Deaton, 1997, p. 70).

Each ISAE strata can be thought of as an independent survey, albeit sampled cumulatively over time, but the extent of sampling across strata (and the precision of each $\widehat{\beta}_s$) is ad hoc. This may affect the WLS estimator. Further, Pesaran et al. (2000) note that neglecting coefficient heterogeneity can result in significant estimates of incorrectly included regressors and bias other parameters even if the erroneously included variables are orthogonal to the true regressors. One may therefore be interested in testing for the presence of parameter heterogeneity. Such tests are based on comparing $\widehat{\beta}_{WLS}$ with $\widehat{\beta}_{OLS}$ estimated off pooled unweighted data. Both estimators will be consistent in the absence of heterogeneity, but they will differ if parameters vary across strata. A version of the test based on

Hausman (1978) can be conducted by running an auxiliary regression,

$$\ln w_s = X_s\theta + \widetilde{W}_s X_s \lambda + v, \text{ with } s = 1, ..., S, \tag{17.7}$$

and testing the null hypothesis $H_0 : \lambda = 0$.

In the subsequent analysis, I present two types of regression estimates. The first is based on a traditional WLS regression estimated using pooled data from all strata. The second is based on equation 17.5, which I refer to as *split-sample weighting*. The calculation of standard errors for both sets of results allows for any form of unconditional heteroscedasticity as well as interdependence of error terms within firms. This is important because person specific error terms will not be independent within firms in matched employer-employee data such as the ISAE. To capture this firm-level clustering I use a panel data version of the Huber/White estimator:

$$\widehat{V}(\widehat{\beta}_s) = (X_s^{'}X_s)^{-1}\left(\sum_{j\in s} X_{sj}^{'}\widehat{\epsilon}_{sj}\widehat{\epsilon}_{sj}^{'}X_{sj}\right)(X_s^{'}X_s)^{-1}, \tag{17.8}$$

where $\widehat{\epsilon}_{sj} = \ln w_{sj} - X_{sj}\widehat{\beta}_s$ is the column vector of estimated error terms for employees of the j-th establishment in stratum s. (The subscript s is dropped when calculating the WLS variance covariance matrix.)

18. Results

18.1. Descriptive Evidence on Wage Gap and Segregation

The simplest comparison of male and female wages conditions on only one explanatory characteristic at a time. The top panel of Table 8 offers such comparison, based on Weighted data in each country and sector. Each table entry is the percentage mean-wage disadvantage of women for a particular worker or firm category. There appears to be a lower mean gender

wage gap for workers with only primary education (representing 8 to 9 years of schooling), except for the Slovak public sector, where relatively little data is included in the sample. Further, higher age seems to imply larger gender pay differentials, except for workers above 50 years of age. The overall gap is smallest for employees of cooperatives in both countries and higher in all ownership categories in the Czech Republic compared to Slovakia. There does not appear to be a strong pattern with respect to firm size, except perhaps for the presence of somewhat lower pay gaps in smaller firms.

Table 8: Weighted Means of Hourly Wage Differences by Gender

		Czech ISAE		Slovak ISAE	
		Public Sector (1)	Non-public Sector (2)	Public Sector (3)	Non-public Sector (4)
Female wage disadvantage as fraction of male wage (1 - w_f / w_m)					
Education	Primary	0.123	0.234	0.233	0.178
	Secondary without GCE	0.179	0.269	0.078	0.239
	Secondary with GCE	0.137	0.263	-0.062	0.187
	University	0.163	0.327	0.165	0.200
	Post-graduate	0.209	0.221	0.018	0.310
Age	-19	-0.026	0.142	-0.078	0.113
	20-29	0.183	0.198	-0.022	0.180
	30-39	0.301	0.301	0.093	0.219
	40-49	0.286	0.292	0.213	0.221
	50-59	0.195	0.270	0.215	0.222
	60-	-0.100	0.120	0.114	0.417
Ownership	Foreign	-	0.280	-	0.280
	Private	-	0.258	-	0.249
	Co-operative	-	0.211	-	0.116
	State	-	0.293	-	0.162
	Mixed	-	0.213	-	0.129
	Public Sector	0.237	-	0.168	-
Firm size	100-249 Employees	0.223	0.237	} 0.135	0.171
	250-499 Employees	0.172	0.250		
	500-999 Employees	0.209	0.267	0.206	0.254
	Over 1000 Employees	0.268	0.285	0.181	0.233
Fraction of female employment by sector					
		0.787	0.391	0.769	0.363
Number of workers		178,209	548,381	13,709	98,989
Number of firms		92	571	35	408

One of the potential sources of gender wage gaps is segregation, which is measured in this Chapter by the fraction of females in a particular occupation, firm, or job cell (defined as a group of workers with the same occupation within a firm). Further, to capture the extent to which women are employed as supervisors, the fraction of females among each firms' supervisory workforce is also calculated. (This statistic is of additional interest as female supervisors may be able to lower the overall pay gap within the firms they work for.) A detailed picture of gender employment segregation is offered in Figures 18.1 to 18.3, where the weighted-sample distribution of the fraction-female statistics is plotted for each sector.

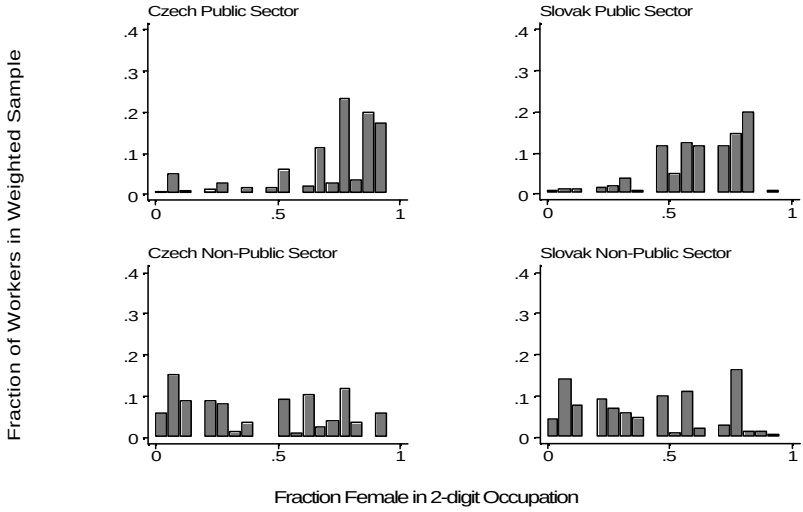

Figure 18.1: Distribution of Occupational Segregation

Figure 18.1 compares the distribution of the fraction of female em-

ployment in 27 2-digit occupations across sectors and countries.[105] The overall pattern is remarkably similar in the two economies. In the public sectors, very few workers are employed in occupations where less than a half of the employees are women. In the non-public sectors, the distribution of "femaleness" of occupations is relatively uniform. This points to the strongest segregation of female and male employment— across sectors. As the bottom panel of Table 8 reports, the public sector employs more than 3 times as many women as men in both countries. While there are more men than women working in the non-public sector, the ratio is not as dramatic.[106]

In Figure 18.2, the two countries appear very similar in terms of firm-level segregation. Note that if the sample workers were assigned randomly to occupations or firms, the distributions in both figures would collapse around the fraction female in the whole sample, which is about 45% in both countries after weighting and combining the two sectors. Finally, Figure 18.3 illustrates the extent of job-cell segregation. Note that about a third of public-sector workers in both countries works in job cells where

[105] In the Czech Republic, I was also able to form an occupational segregation measure using the 1996 Microcensus dataset, which is a household survey conducted by the Czech Statistical Office every four years. It includes 12 thousand employed women and 13 thousand employed men, for whom the mean values of the fraction female in 2-digit occupation in 1996 are 0.648 and 0.330 respectively, quite comparable to the ISAE statistics for 1998.

[106] I do not analyze why women concentrate in public jobs. In part, this is likely to be the consequence of employment practices under central planning or a strong preference for males in enterprise-sector hiring. Alternatively, women may prefer public-sector jobs as these are less demanding and allow for female specialization in domestic sphere (see Section 15.2 for a discussion of endogenous job selection in transition).

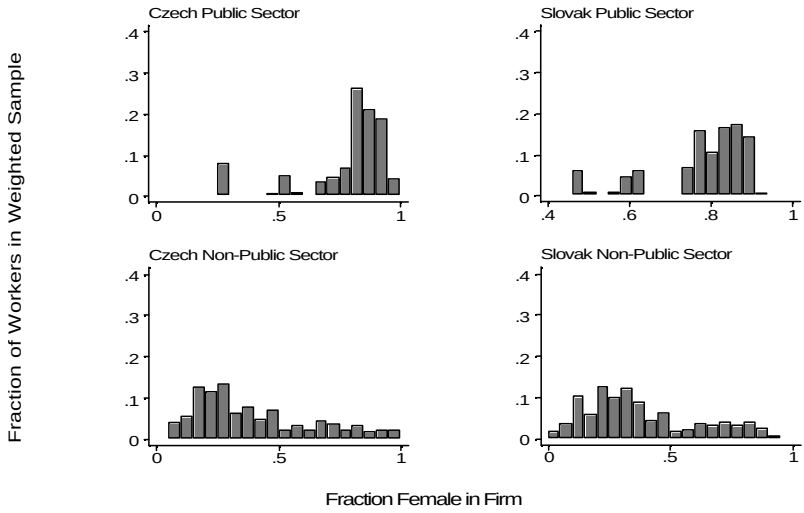

Figure 18.2: Distribution of Firm Segregation

almost all employees are women. Furthermore, in both non-public sectors about 25% of workers are employed in almost fully 'male' job cells.[107] Superimposed on the histograms of job-cell segregation are simulated distributions based on random assignment of sample workers to job cells.[108]

[107] These findings are preserved when only job cells with 10 or more workers are used in generating the distributions since less then 10% of workers in the Slovak data and about 3% of Czech-sample employees work in such small job cells. Recall that the Slovak data consists of a random one-in-three subsample of workers from participating firms.

[108] These distributions are simulated by taking the sexes' overall sample shares and the sample size distribution of job cells as given. Unlike in the case of firm and occupational segregation, the job-cell distributions do not collapse on the fraction of

The comparison to these segregation-free distributions points to significant gender segmentation of job cells.

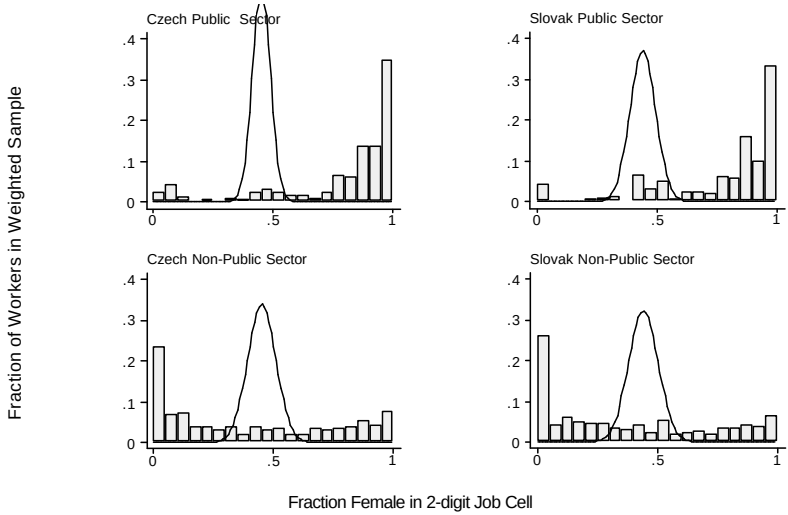

Figure 18.3: Distribution of Job Cell Segregation

18.2. Accounting for the Wage Gap

The simple wage comparisons of Table 8 fail to point to the source of the female/male wage gap. In this section I therefore estimate a series of wage regressions, gradually expanding the set of explanatory variables. First, I explore the standard human capital explanations, as well as sources of the pay differences that are linked to firm characteristics. Table 9 presents estimates of the female dummy coefficient, which measures the

women in the sample. This is caused by the smaller number of workers per job cell.

unexplained portion of the wage gap (see Section 17). In column (1), the female dummy estimate is reported based on a regression where no other explanatory variables are used.

This overall, WLS logarithmic wage gap is about 0.24 in the Czech public sector and almost 0.30 in the Czech non-budgetary sector. The size of the difference between the two gaps suggests that the primary cause of the Czech wage gap does not have to do with the division of labor between the low-paying budgetary and high-paying entrepreneurial sectors as one might expect in light of the dramatic difference in the female fraction of employment in each sector. The unadjusted WLS gap is substantially smaller in Slovakia: 0.15 in the public sector and about 0.23 elsewhere.

The next question is how much of the logarithmic wage gap (represented by the female dummy) can be accounted for by gender differences in workers' productive characteristics. In column (2), I therefore condition on workers' age and education. This reduces the WLS estimate of the Czech public-sector female dummy by about 6 percentage points as women are more likely to have secondary education, while the fraction of college educated is higher for men. In Slovakia's public sector, the reduction in the female dummy estimate is even more pronounced and results in a strikingly low coefficient of about 0.08. This is again due to an unevenly high fraction of college educated male public employees.

Table 9: Estimated Log Wage Differentials by Sex - WLS Regressions

	(1)	(2)	(3)	(4)	(5)
			Czech Public Sector		
Female	-0.241	-0.180	-0.155	-0.156	-0.103
	(0.044)	(0.04)	(0.021)	(0.023)	(0.006)
R-squared	0.073	0.571	0.586	0.621	0.726
Number of workers	178,209	178,209	178,209	178,209	163,072
Number of firms	92	92	92	92	913[c]
			Czech Non-Public Sector		
Female	-0.297	-0.315	-0.266	-0.247	-0.200
	(0.014)	(0.013)	(0.011)	(0.009)	(0.009)
R-squared	0.107	0.385	0.490	0.596	0.715
Number of workers	548,381	548,381	548,381	548,381	530,807
Number of firms	571	571	571	571	6648[c]
			Slovak Public Sector		
Female	-0.152	-0.082	-0.076	-0.078	-0.069
	(0.023)	(0.023)	(0.019)	(0.018)	(0.016)
R-squared	0.025	0.530	0.653	0.676	0.823
Number of workers	13,709	13,709	13,709	13,709	13,662
Number of firms	35	35	35	35	438[c]
			Slovak Non-Public Sector		
Female	-0.227	-0.231	-0.204	-0.179	-0.161
	(0.014)	(0.014)	(0.008)	(0.007)	(0.008)
R-squared	0.064	0.287	0.476	0.600	0.703
Number of workers	98,989	98,989	98,989	98,989	94,130
Number of firms	408	408	408	408	3832[c]
Fixed effects	No	No	No	Firm	Job cell
Worker controls[a]	No	Yes	Yes	Yes	Yes
Firm controls[b]	No	No	Yes	Yes	Yes

[a] Worker's education level, age, and age square.

[b] Firms' employment and its square, ownership, two-digit industry, and

[c] The number of job cell fixed effects. For comparison with columns (4) and (10) of Table 3, only observations where the percentage of female supervisors in firm is

Note: Standard errors are in parenteses; all reported estimates are statistically significant at the 1% level.

In contrast, the wage gap is actually increased by conditioning on human capital characteristics in both the Czech and Slovak non-budgetary sectors, as the overall distribution of education degrees is mildly favorable for women. (A similar result was obtained by Ogloblin, 1999.)

Ogloblin (1999) suggests that most of the Russian gender pay gap can be explained by conditioning on industrial and ownership dummies, as well as on the extent of segregation by occupation. Column (3) of Table 9 reports a specification exploring the first half of his finding for the Czech and Slovak Republics. It appears that controlling for a quadratic in firm size (employment) as well as for a set of dummy variables reflecting 2-digit industrial classification, ownership type, and geographical location of the firm or its establishment does not take away most of the female dummy estimate. In both of the Czech sectors, and in the Slovak non-public economy, the reduction in the unweighted female dummy is about 3 to 4 percentage points.

Further evidence on how much of the gender wage gap is due to between- as opposed to within-establishment components is presented in column (4) of Table 9. This specification includes not only worker-specific productive characteristics, but also a set of firm fixed effects.[109] The female dummy estimates change little. It appears that the firm-level controls used in the previous columns captured most of the firms' impact on gender pay differences in all four sectors. In summary, employer identity plays a secondary but still an important role in the determination of the gender pay gap in both countries.

[109] See Carrington and Troske (1998) for a similar analysis conducted for U.S. manufacturing, where a large portion of the wage gap can be explained by controlling for employer identity.

Table 10a: Estimated Log Wage Differentials by Sex, and Percent Female in Occupation, Firm, Job Cell, and Supervisors within Firm: WLS Regressions

	(1)	(2)	(3)	(4)	(5)	(6)
			Czech Public Sector			
Female	-0.126 *	-0.102 *	-0.092 *	-0.092 *	-0.086 *	-0.078 *
	(0.012)	(0.007)	(0.006)	(0.007)	(0.008)	(0.019)
% female in occupation	-0.162 *	-0.101 *	-0.045	-0.100 *	-0.095	-0.106
	(0.035)	(0.031)	(0.033)	(0.029)	(0.039)	(0.061)
% female in job cell	…	-0.105 *	-0.123 *	-0.155 *	-0.201 *	-0.032
		(0.035)	(0.037)	(0.041)	(0.046)	(0.061)
% female in firm	…	…	…	0.019	0.045	-0.004
				(0.110)	(0.106)	(0.137)
% female supervisors in firm	…	…	…	0.075	0.100	0.009
				(0.062)	(0.063)	(0.068)
R-squared	0.591	0.593	0.592	0.597	0.606	0.442
Number of workers	178,209	178,209	178,209	163,072	61,011	24,108
Number of firms	92	92	92	71	71	71
			Czech Non-Public Sector			
Female	-0.228 *	-0.188 *	-0.158 *	-0.190 *	-0.177 *	-0.134 *
	(0.013)	(0.008)	(0.007)	(0.009)	(0.009)	(0.010)
% female in occupation	-0.152 *	-0.058	-0.056	-0.104	-0.148 *	-0.157
	(0.028)	(0.049)	(0.034)	(0.048)	(0.054)	(0.061)
% female in job cell	…	-0.160 *	-0.162 *	-0.104 *	-0.112	-0.019
		(0.040)	(0.029)	(0.039)	(0.045)	(0.047)
% female in firm	…	…	…	-0.237 *	-0.244 *	-0.205
				(0.085)	(0.087)	(0.097)
% female supervisors in firm	…	…	…	-0.014	-0.007	-0.030
				(0.048)	(0.052)	(0.053)
R-squared	0.495	0.499	0.500	0.512	0.513	0.436
Number of workers	548,381	548,381	548,381	530,807	211,218	87,761
Number of firms	571	571	571	527	523	527
Occupational classification	2-digit	2-digit	4-digit	2-digit	2-digit	2-digit
Age cohorts	All	All	All	All	>45	<25

Next, the first columns of both the Czech and Slovak panel of Table 10 explore the extent to which occupational segregation drives the gender wage differences by conditioning on the percent of female employment within the 2-digit occupational classification as well as on all workers' and firms' characteristics. Occupational segregation in all cases except for the Slovak public sector significantly lowers both female and male wages in

occupations, where a larger fraction of women is employed. The Czech female dummy coefficients are reduced as a result of introducing the occupational segregation measure by about 2 to 4 percent, while the decrease in the Slovak estimates is negligible. These results therefore suggest that occupational segregation is not the primary source of wage differences between men and women in Central European transition economies, in stark contrast to Ogloblin's (1999) analysis of Russian wages.[110]

Columns (2) and (8) of Table 10 ask whether occupational segregation affects wages across firms or within firms. The newly introduced regressor captures the percent of female employment within narrowly defined job cells. The regression estimates suggest that job cell segregation is at least as important as occupational segregation as it further lowers the female dummy coefficient estimate and in one case drives the occupational coefficient out of statistical significance.

The ISAE samples cover 27 2-digit occupations in both countries, while at the 4-digit level, there are 541 occupations in the Czech data and 497 in the Slovak sample. The choice of the 2-digit occupational classification for capturing segregation is relatively arbitrary. In particular, segregation measures based on a more detailed classification suggest more segregation. Columns (3) and (9) therefore offer a direct comparison to columns (2) and (8) by estimating the same specification, but using a 4-digit occupational classification for calculating segregation measures. Even though some of the coefficients change, the qualitative results remain unaffected;

[110] Ogloblin (1999) does not use fraction-female controls, but captures occupational segregation by including fifteen occupational dummy variables capturing 4-digit occupations within each one-digit occupational group which have more than 70% of either female or male workers. Including such dummy variables into the specifications with female-fraction controls in Table 3 has a negligible effect on the estimates.

therefore, I proceed with the 2-digit classification.

Table 10b: Estimated Log Wage Differentials by Sex, and Percent Female in Occupation, Firm, Job Cell, and Supervisors within Firm: WLS Regressions

	(7)	(8)	(9)	(10)	(11)	(12)
			Slovak Public Sector			
Female	-0.073 *	-0.058 *	-0.052 *	-0.060 *	-0.043 *	-0.009
	(0.016)	(0.014)	(0.010)	(0.014)	(0.013)	(0.022)
% female in occupation	-0.018	0.019	-0.151	0.006	-0.104	0.539 *
	(0.041)	(0.053)	(0.068)	(0.056)	(0.105)	(0.103)
% female in job cell	…	-0.061	0.038	-0.057	-0.008	-0.272 *
		(0.039)	(0.052)	(0.044)	(0.069)	(0.080)
% female in firm	…	…	…	-0.352 *	-0.259	-0.530 *
				(0.112)	(0.158)	(0.183)
% female supervisors in firm	…	…	…	0.301 *	0.221 *	0.471 *
				(0.056)	(0.059)	(0.095)
R-squared	0.653	0.654	0.657	0.668	0.685	0.500
Number of workers	13,709	13,709	13,709	13,662	5,348	1,588
Number of firms	35	35	35	34	34	34
			Slovak Non-Public Sector			
Female	-0.177 *	-0.140 *	-0.126 *	-0.140 *	-0.128 *	-0.108 *
	(0.009)	(0.007)	(0.007)	(0.007)	(0.009)	(0.011)
% female in occupation	-0.136 *	-0.072 *	-0.081 *	-0.098 *	-0.146 *	-0.006
	(0.018)	(0.026)	(0.023)	(0.025)	(0.026)	(0.031)
% female in job cell	…	-0.124 *	-0.104 *	-0.060 *	-0.075 *	-0.054
		(0.026)	(0.023)	(0.019)	(0.024)	(0.026)
% female in firm	…	…	…	-0.175	-0.118	-0.169
				(0.073)	(0.078)	(0.073)
% female supervisors in firm	…	…	…	-0.103	-0.154 *	-0.063
				(0.041)	(0.048)	(0.038)
R-squared	0.481	0.484	0.483	0.491	0.531	0.430
Number of workers	98,989	98,989	98,989	94,130	31,756	12,927
Number of firms	408	408	408	390	386	387
Occupational classification	2-digit	2-digit	4-digit	2-digit	2-digit	2-digit
Age cohorts	All	All	All	All	>45	<25

Notes: The symbol * indicates statistical significance at the 1% level. Standard errors are in parentheses. All specifications include the following set of control variables: workers' education level, age and age square; firms' employment and its square,

The richest specification is presented in columns (4) and (10), where a firm-level segregation measure is added to the list of covariates, together

with the fraction of females among each firm's supervisory workers.[111] In both sectors of the Czech economy, the female dummy and the job-cell segregation coefficient are statistically significant at the 1% level, and the firm-level segregation parameter is significant in the non-public sector. In the Slovak public sector, both the negative effect of job cell segregation and the positive coefficient of the female fraction of the supervisory workforce are significant, together with the female dummy. In the Slovak non-public sector, on the other hand, the important effects appear to be those of occupational and job-cell segregation. Further, note that in both public sectors, over one third of the original female dummy coefficient from column (1) of Table 9 remains after conditioning on all forms of segregation as well as on all other available explanatory characteristics. This 'unexplained' fraction reaches about two thirds in both the Czech and Slovak non-public sectors, suggesting that potential violations of the equal pay provision are much more important outside of the budgetary sectors. In Slovakia's public sector, the female dummy estimate of column (7) is less than one quarter of the total pay gap, suggesting very little scope for gender pay discrimination. Unfortunately, the ISAE data does not provide full coverage of the Slovak public sector, so this result, while interesting, should be given less Weight in terms of policy implications than the estimates from the other three sectors.

Similar to the data used by Ogloblin (1999) in Russia, the Czech and Slovak ISAE surveys do not include information on actual length of la-

[111] No supervisory workforce was reported for a fraction of firms and these firms were omitted from the subsequent analysis. This lack of data on supervisors may be a result of firms not reporting on their top management and/or miscoding the occupational classification.

bor market experience and/or the number of children. It is therefore impossible to accurately capture the different labor market experience of men and women[112] and to control for important productivity-related characteristics. This is most likely to bias the female dummy coefficient upward. Maternity-related gender differences in labor market experience can be expected to be smallest for both older cohorts of workers, where the effect of previous labor market interruptions may already be wiped out, and younger cohorts, which have had relatively few leaves from the labor market.[113] I therefore separately estimate the preferred specification (columns 4 and 10 of Table 10) for workers aged over 45 and under 25 (see Table 10). The female dummy estimates based on the older workers are only somewhat lower than the overall results. This is consistent with the view that women never recover the penalty for early-career labor market interruptions since the main career promotion occurs during 'fertility' ages. The results for the younger cohort, however, offer a very different picture, especially in the Slovak public sector, where the scope for equal pay act violations is eliminated. There are two potential explanations for these results. Younger women may be paid relatively more equally to men as a result of having had fewer labor market interruptions. Alternatively, their career paths and remuneration practices may differ fundamentally from those of older women who had spent most of their working life un-

[112] Women in the Czech and Slovak Republics rely on an extensive public system of child-care, generous family allowances, and guaranteed maternity leaves of up to 3 years.

[113] During transition, young women became more likely to substitute careers for early motherhood. Between 1993 and 1997, the number of children born per 1000 women aged 20-24 decreased from 145.6 to 85.5 in the Czech Republic and from 166.7 to 106.2 in Slovakia (Charles University, 1999; Slovak Statistical Office, 1998).

der communism. The second explanation is particularly interesting and deserves further attention in future research.

In Slovakia, only a random one-in-three subsample of workers from surveyed firms was used in the analysis. This implies that the segregation measures, especially those related to individual firms, may be measured with error. Therefore, I also compare the female dummy coefficient from the preferred specification of columns (4) and (10) of Table 10 to its estimate from a job-cell fixed effect specification from column (5) of Table 9. Job cell fixed effects absorb all industry, occupation, and firm effects and account for any form of segregation in a fully unrestricted fashion. The female dummy estimates from the job-cell fixed effect specifications are only somewhat larger, suggesting a minor effect of measurement error.

It was argued in Section 17 that the WLS estimator imposes the parameter variation across strata to be independent of the data moment matrices. To assess the sensitivity of the estimates to this assumption I compare the WLS estimates to alternative unreported results based on the split-sample weighting procedure.[114] The richest specification estimable using the split-sample procedure is fully comparable to the preferred WLS specification in columns (4) and (10) of Table 10.[115] Finally, in another unreported specification I relax the equality of coefficients across gender.

[114] The Hausman-type test for presence of important parameter heterogeneity across strata (based on equation 17.7 and using estimates of the covariance matrix from equation 17.8) signals the need for weighting in every estimated specification. The test is always highly statistically significant; therefore, I do not report the test values.

[115] Note that estimating a full set of the firm-specific coefficients using the split-sample weighting procedure is infeasible due to the small number of firms within many strata. In most of the split-sample specifications I therefore condition on a set of firm fixed effects.

Most of the estimated segregation effects in the non-public sectors are similar for men and women (relative to the size of standard errors).[116]

18.3. Decomposing the Wage Gap

The sensitivity tests given above do not reject columns (4) and (10) of Table 10 as a preferred specification; therefore, I use it in all four sectors to calculate a mean wage decomposition.[117] Table 11 reports the decomposition for the Czech public sector. The first column lists the unadjusted overall pay gap from the first column of Table 9, while column (2) of Table 11 reports most of the parameter estimates from the specification reported in column (4) of Table 10. Over a third of the overall gender wage gap is due to gender differences in wages that remain after controlling for all available explanatory characteristics. Another third is explained by the segregation of women into low-paying occupations and job cells. Finally, the last third of the pay gap is attributable to the uneven distribution of education among men and women in the Czech budgetary sector. Specifically, men are much more likely to have a university education than women.

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[116] On the other hand, there are larger differences in the public sectors. For example, the significantly estimated positive effect of the fraction of female supervisors within firms in the Slovak public sector is much larger for women than for men.

[117] I note that the weighted average of the gender-specific coefficients with female sample proportion 0.45) is very similar to the pooled-regression coefficients of columns (4) and (10) of Table 3. This also applies to the non-reported coefficients. Hence, for practical purposes, my quantification of the unexplained part of the gap based on the female dummy estimate from the pooled-data regression is equivalent to what one obtains using the decomposition identity of equation 17.2.

Table 11: Wage Gap Decomposition for Czech Public Sector

	Coefficient estimate (1)	Coefficient estimate (2)	Mean difference women - men (3)	Absolute contribution to wage gap, (2) x (3)	Relative contribution to wage gap (2)x(3)/(1)
Female	-0.241 *	-0.092 *	1.000	-0.092	0.382
	(0.044)	(0.007)			
% female in occupation	…	-0.1 *	0.287	-0.029	0.118
		(0.029)			
% female in job cell	…	-0.155 *	0.455	-0.070	0.292
		(0.041)			
% female in firm	…	0.019	0.190	0.004	-0.015
		(0.11)			
% female supervisors in firm	…	0.075	0.235	0.018	-0.073
		(0.062)			
Age	…	0.038 *	3.212	0.123	-0.509
		(0.003)			
Age squared	…	-0.036 *	1.470	-0.052	0.217
		(0.003)			
Firm employment/1000	…	0.005	11.297	0.057	-0.234
		(0.004)			
(Firm empl./10000)^2	…	-0.005	12.084	-0.065	0.269
		(0.005)			
Secondary education without GCE	…	0.117 *	-0.037	-0.004	0.018
		(0.012)			
Secondary education with GCE	…	0.494 *	0.253	0.125	-0.518
		(0.017)			
University education	…	0.717 *	-0.225	-0.162	0.670
		(0.025)			
Post-graduate education	…	0.893 *	-0.034	-0.030	0.124
		(0.028)			
R-squared	0.094	0.632		-0.145	
Number of workers	178,209	163,072			
Number of firms	92	71			

Note: Column (1) comes from column (1) of Table 2; column (2) comes from column (4) of Table 3. The mean differences and coefficients for the regional and two-digit industrial dummies are not reported but are included in the calculations.

Table 12: Wage Gap Decomposition for Czech Non-Public Sector

	Coefficient estimate (1)	Coefficient estimate (2)	Mean difference women - men (3)	Absolute contribution to wage gap, (2) x (3)	Relative contribution to wage gap (2)x(3)/(1)
Female	-0.297 *	-0.19 *	1.000	-0.190	0.639
	(0.014)	(0.009)			
% female in occupation	…	-0.104	0.328	-0.034	0.115
		(0.048)			
% female in job cell	…	-0.104 *	0.512	-0.053	0.180
		(0.039)			
% female in firm	…	-0.237 *	0.236	-0.056	0.188
		(0.085)			
% female supervisors in firm	…	-0.014	0.166	-0.002	0.008
		(0.048)			
Age	…	0.031 *	-0.169	-0.005	0.018
		(0.001)			
Age squared	…	-0.034 *	-0.125	0.004	-0.014
		(0.002)			
Firm employment/1000	…	0.009	-0.634	-0.006	0.020
		(0.005)			
(Firm empl./10000)^2	…	-0.015	-0.144	0.002	-0.007
		(0.0001)			
Secondary education without GCE	…	0.116 *	-0.139	-0.016	0.054
		(0.013)			
Secondary education with GCE	…	0.386 *	0.122	0.047	-0.159
		(0.012)			
University education	…	0.722 *	-0.029	-0.021	0.069
		(0.031)			
Post-graduate education	…	0.852 *	-0.004	-0.003	0.011
		(0.049)			
R-squared	0.107	0.501			
Number of workers	548,381	530,807			
Number of firms	571	527			

Note: Column (1) comes from column (1) of Table 2; column (2) comes from column (4) of Table 3. The mean differences and coefficients for the regional and two-digit industrial dummies are not reported but are included in the calculations.

As mentioned earlier, the picture is dramatically different in both the Czech and Slovak non-public sector (see Tables 12 and 14). Here, almost two thirds of the overall pay gap remain unexplained by other factors and the potential scope for gender pay discrimination appears high. If all of this female dummy estimate was due to discrimination, female wages would be raised by about one fifth through full compliance with the equal pay act. A substantial part of this unexplained gap is, however, likely to be due to maternity-related differences in the labor market experience of men and women, which none of the estimated regressions controls for. Similar to the results for the Czech public sector, the decompositions in Table 12 and 14 suggest that employment segregation is related to over one third of the total gender pay gap in Czech and Slovak non-public employment.[118]

The overall gender pay difference, as well as the potential extent of pay discrimination are lowest in the Slovak public sector as shown in Table 13, which also documents the relatively small effect of segregation on the female dummy estimate. The largest part of the gap is attributable to a higher fraction of male college-educated public employees. Unfortunately, the Slovak public-sector results are based on a relatively small sample and in particular say little about gender pay differences in Slovakia's public administration.

[118] The channels of the effect are different, though, between the two countries. While in the Slovak non-public sector, it is the occupational and job cell segregation that drives the pay wedge between genders, firm-level segregation is equally important in the Czech non-public sector. The wage impacts of gender differences in educational attainment average out across the different degrees to a negligible effect. Other worker- or firm-specific characteristics also attribute little to the mean wage difference between genders.

Table 13: Wage Gap Decomposition for Slovak Non-Public Sector

	Coefficient estimate (1)	Coefficient estimate (2)	Mean difference women - men (3)	Absolute contribution to wage gap, (2) x (3)	Relative contribution to wage gap (2)x(3)/(1)
Female	-0.227 *	-0.14 *	1.000	-0.140	0.616
	(0.014)	(0.007)			
% female in occupation	…	-0.098 *	0.252	-0.025	0.109
		(0.025)			
% female in job cell	…	-0.06 *	0.489	-0.029	0.130
		(0.019)			
% female in firm	…	-0.175 *	0.211	-0.037	0.162
		(0.073)			
% female supervisors in firm	…	-0.103 *	0.153	-0.016	0.070
		(0.041)			
Age	…	0.036 *	-0.684	-0.024	0.108
		(0.002)			
Age squared	…	-0.038 *	-0.658	0.025	-0.111
		(0.002)			
Firm employment/1000	…	0.066 *	-0.621	-0.041	0.182
		(0.011)			
(Firm empl./1000)^2	…	-0.009 *	-1.821	0.016	-0.069
		(0.002)			
Secondary education without GCE	…	0.085 *	-0.141	-0.012	0.053
		(0.01)			
Secondary education with GCE	…	0.251 *	0.090	0.023	-0.099
		(0.013)			
University education	…	0.631 *	-0.023	-0.014	0.063
		(0.032)			
Post-graduate education	…	0.827 *	-0.002	-0.001	0.006
		(0.079)			
R-squared	0.079	0.521			
Number of workers	98,989	94,130			
Number of firms	408	390			

Note: Column (1) comes from column (1) of Table 2; column (2) comes from column (10) of Table 3. The mean differences and coefficients for the regional and two-digit industrial dummies are not reported but are included in the calculations.

Table 14: Wage Gap Decomposition for Slovak Public Sector

	Coefficient estimate (1)	Coefficient estimate (2)	Mean difference women - men (3)	Absolute contribution to wage gap, (2) x (3)	Relative contribution to wage gap (2)x(3)/(1)
Female	-0.152 *	-0.06 *	1.000	-0.060	0.395
	(0.023)	(0.014)			
% female in occupation	…	0.006	0.168	0.001	-0.007
		(0.056)			
% female in job cell	…	-0.057	0.396	-0.023	0.148
		(0.044)			
% female in firm	…	-0.352 *	0.083	-0.029	0.191
		(0.112)			
% female supervisors in firm	…	0.301 *	0.088	0.027	-0.174
		(0.056)			
Age	…	0.031 *	-3.573	-0.110	0.718
		(0.002)			
Age squared	…	-0.029 *	-3.452	0.101	-0.662
		(0.003)			
Firm employment/1000	…	-0.024	-0.040	0.001	-0.006
		(0.038)			
(Firm empl./1000)^2	…	0.027	-0.111	-0.003	0.020
		(0.023)			
Secondary education without GCE	…	0.198 *	-0.109	-0.022	0.142
		(0.025)			
Secondary education with GCE	…	0.465 *	0.304	0.141	-0.928
		(0.027)			
University education	…	0.825 *	-0.129	-0.107	0.701
		(0.031)			
Post-graduate education	…	0.966 *	-0.121	-0.116	0.764
		(0.102)			
R-squared	0.039	0.630			
Number of workers	13,709	13,662			
Number of firms	35	34			

Note: Column (1) comes from column (1) of Table 2; column (2) comes from column (10) of Table 3. The mean differences and coefficients for the regional and two-digit industrial dummies are not reported but are included in the calculations.

18.4. Cross-Country Comparison

The motivation for this Chapter is to offer a decomposition of the gender wage gap not available to the existing transition research and relevant for implementing the newly enacted anti-discrimination laws. However, one can further think of the results of this Chapter as forming basis for future cross-country research. Below, I discuss selected competing hypotheses about the sources of cross-country differences in segregation and gender wage gap. Of course, identifying the roles of the many potential determinants will be only possible when more country and time observations on sex segregation and pay gap are available.

The analysis presented above allows for three cross-country comparisons. First, one can compare the present findings to those of Bayard et al. (in press) based on a similar data set from the U.S. Apparently, the Czech, and to a lesser degree Slovak, gender segregation and wage gap structure are quite similar to those of the U.S. The mean difference between women and men in the fraction female in occupation (job cell) based on the highest level of occupational disaggregation[119] is 0.396 (0.744) in the U.S. while it is 0.460 (0.623) in the Czech non-public sector and only 0.252 (0.489) in Slovak non-public firms. The main difference in the structure of the wage gap is in the importance of its unexplained part. In the non-public sectors of the Czech and Slovak Republics, about two thirds of the wage gap is unexplained and potentially related to discrimination, which compares unfavorably to less than one third in the U.S. (In the U.S., however, the overall gap is larger at over 40%.) It is possible that this difference is driven by the lack of information in the Czech and Slo-

[119] In the U.S. data, one can distinguish 491 occupations while in the Czech (Slovak) samples, there are 541 (497) occupational classes.

vak data on the number of children and labor market experience. The estimated female dummy coefficients for the youngest cohort are indeed lower than the all-sample estimate and resemble the U.S. coefficients.

Second, it is interesting to compare the findings of this research to those that Ogloblin (1999) presents for Russia. In contrast to Russia, occupational segregation does not appear to be the main driving force of the pay gap between men and women. Especially in the Czech and Slovak non-public sectors, the largest component of the gap appears hidden within narrowly defined job cells. The differential impact of sex segregation between Russia and Central Europe clearly calls for future research. The difference in findings may be in part caused by the different samples used in the two studies. While this Chapter relies on enterprise employment in medium and large firms, Ogloblin (1999) uses a household survey. On the other hand, this contrast between the Russian findings and those for the Czech and Slovak Republics corroborates the differences between the gender wage gap in Eastern Europe and the Former Soviet Union painted by Brainerd (2000).

Third, one can compare the Czechs and Slovaks. Their two economies were part of a federation until 1993 and shared the same institutional infrastructure. Consequently, there is little difference in educational attainment as well as most other characteristics, except for the higher share of private firms (as opposed to state-owned) in the Czech economy. This reflects the somewhat slower progress of marked-oriented transformation in Slovakia (see, e.g., Svejnar, 1999). Overall, I find a quite similar structure of the gender wage gap in the two countries, with the wage gap being smaller in Slovakia.

What can one distill from the cross-country comparisons? First, the Czech and Slovak findings are more similar to western patterns than to

those of the less-developed Russian economy. Given that the U.S. labor market has been subject to many years of anti-discrimination legislation, this comparison may signal a small potential effect of the newly enacted laws in Central Europe.

Second, what is the source of the larger Czech pay gap compared to Slovakia? It is relatively unlikely to present a consequence of the differential speed of free-market reforms for at least two reasons. Multi-country studies, such as Newell and Reilly (2000), conclude that the adjustment process of transition appears neutral to the gender pay gap. Furthermore, my decompositions suggest that little of the cross-country difference in the gender wage gap is driven by differences in worker or firm characteristics including firm ownership, which represents the main observable difference in the characteristics of the two economies. A related explanation is motivated by Blau and Khan (1992) who suggest the overall level of wage differentiation as an important factor explaining female-male pay differences across countries. However, in 1998, the hourly-wage dispersion in the Czech and Slovak medium and large firms appears almost identical, which confirms the findings of Brainard (2000) from early transition.[120] Hence, this Czech-Slovak finding calls for future research. Among the potential sources of this cross-country difference not explored in the present analysis is the higher level of unemployment in Slovakia[121] and potentially higher selection of low-earning Slovak women out of employment.

[120] The 90-10 log-wage decile differences are close to 1 in both economies.

[121] Unemployment rates were much higher in Slovakia than in the Czech lands from the outset of transition. In the sample-period quarters of 1998, the unemployment rates were 4.8% for Czech men and 7.3% for Czech women and 12.2% for Slovak men and 13.4% for Slovak women.

See Hunt (2002) for a before/after household-data analysis of East German transition suggesting that reductions in the gender pay gap are partly due to selective non-employment of low-skill low-wage women.

19. Conclusion

This Chapter sheds light on the channels through which gender segregation and an individual's sex affect the overall gender wage gap in the Czech and Slovak Republics. These countries, similar to other transition economies aiming at joining the EU, are now in the process of enacting and implementing standard western-style anti-discrimination labor market policies. The empirical results presented here provide a measure of the potential efficacy of these policies in reducing the overall gender pay differential.[122]

The evidence given here on hourly wage rates in Czech and Slovak medium and large enterprises suggests that on average female wages are about 30% lower than male wages in the Czech Republic. This difference is somewhat lower in the Czech budgetary sector. The gender wage gap is generally lower in Slovakia and appears particularly low in the Slovak public sector. A substantial part of the gender pay gap is attributable to differences in educational attainment of men and women in the Czech and Slovak public sectors, where hiring and promotion practices should

[122] By capturing the situation immediately before the anti-discrimination rules are legally enacted, the present analysis also serves as a detailed benchmark for future measurement of the actual effect of the anti-discrimination efforts in transition countries. Pre-accession countries provide a laboratory where anti-discrimination laws are introduced at varying levels of development and where rich micro data will often be available to observe the impact of all of these policies in detail.

be particularly easy to affect.

The evidence on gender segregation implies that even though wages are typically lower in the public sectors, which employ over three times as many women as men, this imbalance is not the primary cause of the overall gender pay gap. Segregation of women into low-paying occupations, firms and job cells appears responsible for over one third of the total wage gap. Furthermore, in the non-public sectors of the Czech and Slovak Republics, about two thirds of the total wage gap appears to be due to gender differences in wages that remain after accounting for most forms of workplace segregation as well as for other explanatory variables.[123] However, the estimated 'pure' (unexplained) wage effect of the individual's sex is likely to be affected by the lack of information in the Czech and Slovak data on the actual length of labor market experience and the number of children.

Finally, in the Czech and Slovak Republics, it is not occupational segregation that is to blame for most of the gender wage gap, but rather within-occupation within-establishment phenomena. This implies a specific strategy for reducing the gender pay gap. Attention should not be paid primarily to differences in remuneration across occupations (comparable worth policies), but rather to potential within-establishment pay discrimination, especially violations of the equal pay clause.

[123] A natural interpretation for the smaller unexplained gaps in the public sectors is related to the use of wage grids, which likely limit the effect of gender on wages in public firms.

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