

# Educational Expansion and Inequality in Taiwan and the Czech Republic

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This article presents a comparative analysis of educational inequality by family background and gender in Taiwan and the Czech Republic, which have both experienced substantial educational expansion in the last half-century under different educational systems. We highlight the specific institutional histories of both countries and examine the role of dead-end tracks in mediating educational inequality by family background. Pooling the most recent data available, we use probit analyses of inequality in secondary and tertiary educational attainment across 5-year birth cohorts from 1956 to 1985. In terms of secondary educational attainment, we find that the gap in inequalities by family background between the countries is large, with a decline in inequality in Taiwan but persistent inequality in the Czech case. We attribute these findings to differences in educational expansion and characteristics of the secondary school system. However, in tertiary educational attainment, we find similarities in educational inequality between the two countries.

## Introduction

Over the last century, educational systems around the globe have experienced different degrees of educational expansion. Worldwide, enrollment in higher education institutions increased from 500,000 in 1900 to about 100 million in 2000, with the most rapid expansion having taken place not only in more economically developed and globalized countries, but also in those that previously also expanded their systems of secondary education (Schofer and Meyer 2005). While it was believed that such expansions in enrollment would grant a greater share of educational opportunities to pupils of lower social backgrounds, thus reducing educational inequalities, empirical studies have found that this is often not the case (Shavit and Blossfeld 1993). During times of educational expansion, educational inequalities can increase, decrease, or remain stable, depending on the mechanisms of

This article was made possible due to financial support from the Czech Science Foundation (grant P404/12/J006) and the Ministry of Science and Technology of Taiwan (formerly National Science Council, grant NSC 101-2923-H-001-001-MY3) via the joint research project "Educational Stratification in Taiwan and the Czech Republic: Accessibility of and Heterogeneous Returns to Higher Education." We would like to thank Wei-Chun Huang for research assistance.

Received December 12, 2012; revised June 30, 2013, October 4, 2014, and July 6, 2015; accepted September 14, 2015; electronically published March 21, 2016

*Comparative Education Review*, vol. 60, no. 2.

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0010-4086/2016/6002-0010\$10.00

exclusion and adaptation that upper social classes employ in the school system (Alon 2009).

If the system of secondary education is highly differentiated by quality and opportunity, parents with high social and economic status may be much better positioned than other parents to both understand and prepare their children to attend secondary schools that provide the greatest access to selective universities. Researchers have found that the mechanisms through which parents influence the educational attainment of their children are dependent on the institutional characteristics of the educational system, which create, delimit, and accentuate pathways for the intergenerational transfer of educational status (Allmendinger 1989; Kerckhoff 1995; Werfhorst and Mijs 2010). To shed light on the role of educational systems on the development of educational inequalities over periods of educational expansion, we present a comparative case study of two countries representing quite different educational systems: Taiwan and the Czech Republic. While we recognize the risk of underidentification in a comparison of two countries, such a research design is both widely used in the comparative education literature (e.g., Kerckhoff 1977; Maurice et al. 1986; König and Müller 1986) and has the advantage of richly describing the development and features of secondary and tertiary educational systems and their impact on the inequality of educational opportunity.

Why compare the role of educational expansion on inequality in these two countries? First, both countries were selected as examples of larger groups of quite different educational systems—what one might call the German model and the East Asian model. Scholars often regard educational systems based on the German model to be among the most stratified in the world (Ertl and Phillips 2000; Buchmann and Park 2009). This model is characterized by a highly differentiated system of secondary education offering vocationally specific apprentice programs, which are dead-end tracks that provide pupils with focused labor market opportunities but not credentials needed for tertiary education. Germany, Austria, Switzerland, Czech Republic, Slovakia, Poland, Slovenia, and Hungary are similar in this regard, as well as have geographic, historical, and other commonalities. However, generalizations can only go so far: educational system characteristics can vary within federal states, including Germany, while other countries, such as Poland and Hungary, have reformed their systems of secondary education over time, making it difficult to control for changes in institutional context. The Czech Republic, by contrast, is an ideal case study of this type of system because it has maintained the structure of its secondary education system for the entire time period under study.

In a parallel fashion, Taiwan's educational system is directly based on the Japanese model and practiced in many East Asian countries, such as Japan, South Korea, Singapore, Hong Kong, and mainland China. That model is

characterized by a more universal system emphasizing general education, standardized testing, widespread after-school tutoring (Huang 2013), and high cultural demands for students' academic achievement made by parents and teachers. In contrast to the German model, the East Asian model does not have dead-end vocational tracks, as all types of secondary schools prepare pupils for potentially applying to tertiary education. For the purposes of a cohort study, Taiwan is a useful case study of the East Asian model because it was a front-runner in the expansion of secondary education and subsequently also tertiary education, and thus the consequences of such expansion on educational inequality would be relevant for other countries in the region. While the lessons learned from comparing these two countries may very well resonate within their respective regions, the comparison may be less relevant to other educational systems with different degrees or types of within-school tracking, or where there has been little educational expansion.

In addition, comparative case studies of the mediating role of institutional context on inequality are still of vital importance because large-*n* cross-national studies have not been able to quantify variance in educational system characteristics in a unified way. Pfeiffer (2008) found that highly differentiated educational systems, such as those with dead-end educational pathways at the secondary level, have higher degrees of educational inequality compared to other industrialized countries with less differentiated systems. However, broad categorizations of countries in terms of "low," "high," and "very high" degrees of institutional differentiation are prone to error due to the lack of detail; if countries were categorized differently (the Czech system could be categorized as "very high" rather than "high"), such recategorizations would fundamentally affect the conclusions reached. The advantage of a comparative case study approach is that we can provide a detailed analysis of which specific institutional characteristics matter most in terms of changes in educational inequality over time, while also contrasting those characteristics between countries to provide a deeper understanding of the degree of institutional variation involved.

Finally, a comparison of Taiwan and the Czech Republic is fascinating given the historical similarities and differences in their patterns of educational expansion. In both countries, enrollment rates in tertiary education have increased steeply, from 21 to 67 percent between 1991 and 2010 in Taiwan, and from 16 to 55 percent between 1991 and 2010 in the Czech Republic. In both countries, this expansion of tertiary education was a result of popular demand for increased educational opportunities in newly democratized societies and of market pressure for skilled labor in national economies that were highly open, export-driven, and exposed to intense regional competition. At the same time, in both countries the expansion of tertiary education was accompanied by a similar increase in enrollment in upper secondary education, from less than 80 percent in 1990 to nearly universal enrollment by

2010. Despite these remarkable similarities, one key difference remains: both upper secondary education tracks in Taiwan (senior high and senior vocational tracks)<sup>1</sup> provide degrees that qualify students for tertiary education (ISCED 3A), while the Czech Republic has retained a system of secondary education comprised of ISCED 3A grammar and technical schools, as well as ISCED 3C vocational schools,<sup>2</sup> in which 30 percent of those currently concluding upper secondary education do not receive the school-leaving exam (*maturita*) necessary for admission to tertiary education. How might the development of educational expansion, and differences in school systems, explain trends in the inequality of educational opportunity by gender and family background over time?

To answer that question, this article pools recent survey data for both countries to provide a detailed cohort analysis of the role of gender and family background on the transition to both secondary and tertiary education, based on information about the highest education attained. We conduct probit analyses of those transitions across cohorts that are also largely comparable across both countries, as well as analyses that are more country-specific. By examining 5-year birth cohorts beginning with the year 1956, we provide a more fine-grained analysis of the change in the determination of educational opportunity by gender and family background across periods of educational restriction and expansion than has been carried out to date in these countries (e.g., Shavit et al. 2007).

The article is organized as follows. We first set up the comparative analysis by providing background information on Czech and Taiwanese educational systems and their history of educational expansion. The theory section provides a standard overview of key papers in the educational transitions literature from which we draw hypotheses, and the data and methods section focuses on the difficult choices we had to make in carrying out the analysis. The presentation of the results follows.

<sup>1</sup> About one-third of Taiwanese secondary schools are senior high schools, and one-third are vocational schools; the final third of “comprehensive” schools offer both senior high and vocational tracks. Our data contain information only on the track pursued. We have not found any evidence from the literature that the value of a senior high secondary degree varies by whether or not that degree was attained in a senior high school or a comprehensive school.

<sup>2</sup> UNESCO’s International Standard Classification of Education (ISCED) distinguishes three types of upper secondary education: (1) 3A programs designed to provide direct access to university study, (2) 3B programs designed to provide direct access to practically oriented or occupationally specific tertiary institutions, and (3) 3C programs that are not designed to lead to any tertiary education. Because major research universities are more prestigious than practically oriented colleges, the upper secondary institutions that provide access to them are also more prestigious. In the Czech example, most students who attend Czech vocational schools have almost no chance for admission to tertiary education because they do not take the secondary school leaving examination (*maturita*), which is required for college/university entry. “Senior vocational schools” in Taiwan are more like the “secondary technical schools” in the Czech Republic, because students in both types of school receive a technical education (e.g., emphasizing computer science or engineering) and can receive a school-leaving exam qualifying them for university entry.

**Educational Systems and Educational Expansion in Taiwan and the Czech Republic**

National differences in the structure of educational systems shape variations in educational inequality by family background. Kerckhoff's study (1977) of 13-year-old boys in the United States and England found that the more differentiated English system forces children and their parents to make irreversible decisions about their educational careers, whereas the less differentiated US system provides "more opportunity for adolescents to change course throughout secondary school and encourages the belief that such a change is possible" (Kerckhoff 1977, 564). Müller and Karle (1993) similarly found that national educational systems channel and constrain the decisions of pupils at each educational transition, contributing to differences in the educational attainment of boys across nine different countries. Comparative studies between France and Germany have been particularly important in both the development of typologies of educational systems, and their consequences on future occupational trajectories (König and Müller 1986; Maurice et al. 1986).

Our terminology for understanding the role of institutional context on educational inequality is based on the systematic approach introduced by Müller and Shavit (1998). In their words, the *stratification* of the school system refers to the degree to which students attend different kinds of school of varying prestige that provide different degrees of access and opportunities for more advanced schooling. Educational systems differ in their degree of *vocational specificity*, that is, the degree to which schools prepare students for particular vocations, often measured in terms of the proportion of students leaving the educational system with specific skills. Educational systems differ in their degree of *standardization*, or the degree to which governments provide the same resources, conditions, or rules for students to achieve certain standards of quality in education provided by different schools. In this analysis, we hone in on the role of vocational specificity (presence of ISCED 3C schools in the Czech Republic, but not in Taiwan) in mediating the impact of family background on educational attainment.

When seen up close, many of the similarities and differences between Taiwan and the Czech Republic in terms of their historical, cultural, and economic context are embedded in the features of their educational systems. Both systems were developed by their prior imperial powers (Japan and Austria, respectively) and continue to strongly resemble those systems. Both countries currently have nine years of compulsory education with very low dropout rates, upper secondary education that offers both general and vocational education with high participation and completion rates, and a rapidly expanding system of tertiary education. While public schools are most prestigious and less expensive, private schools have gained recent popularity in both countries. While the Czech educational system tracks students from a

very early age into programs of different types and intensity, in Taiwan, system stratification by prestige largely begins in the transition to upper secondary education.

In Taiwan, the Japanese imposed a Western-style educational system during their colonial rule (1895–1945), which involved the implementation of basic compulsory schooling by educating the masses in literacy, practical skills, and political obedience (Tsai and Shavit 2007). After the takeover of Taiwan by the Nationalist Chinese government (KMT) in 1945, which ruled the island continuously until 1987, standardized education appeared to be the most direct way to bring the Japanized Taiwanese back to Chinese cultural orthodoxy and nationalist sympathies (Gates 1987). The KMT government kept the basic pattern established by the Japanese and expanded compulsory education from 6 to 9 years in 1968. As a consequence, the enrollment rate in secondary education increased from 46 percent for boys and 40 percent for girls in 1976, to 85 and 90 percent, respectively, just 15 years later.

It is important to note that the high degree of standardization in Taiwanese compulsory education does not mean that other factors are powerless to influence student achievement. Recent analyses of math performance of 8th graders have shown that in Taiwan, the effect of family background, measured in terms of the number of books in the home, on math performance is the second strongest of 54 countries around the world participating in TIMSS surveys (Schütz et al. 2008). Similarly, the share of between-classroom variance in the total variance of math performance of Taiwanese pupils increases from 17 percent in the 4th grade to 30 percent in the 8th grade (Huang 2009), which suggests the possibility of hidden tracking mechanisms or differences in teacher quality between junior high classrooms.

In terms of upper secondary education, Taiwan has two main tracks: senior high and senior vocational schools (both ISCED 3A), which span grades 10–12 and qualify graduates for possible tertiary education (some “mixed” secondary schools contain both senior high and vocational tracks, but such schools should not be viewed as having a third track of education). Senior high schools are more prestigious, where students may select science or liberal arts tracks, depending on where their interests lie. By contrast, senior vocational schools place a heavier emphasis on practical skills where students choose a single focus, such as electrical engineering, civil engineering, computer science, or business. To ensure that the emerging cohort of secondary school pupils had the skills demanded by the marketplace, the KMT government imposed a strict 30:70 ratio in total attendance between senior high schools and vocational high schools, a goal that was achieved by 1980 but later reversed. While students from both types of school can apply for tertiary education, in 2010, 82 percent of vocational high school students transitioned to tertiary education (84 percent of girls and 81 percent of boys), while



95 percent of senior high students did so (96 percent of girls and 94 percent of boys).

Future educational and occupational attainment is widely believed to be contingent on getting into a well-ranked high school based on nationally competitive student examinations (Tsai et al. 1994). Taiwanese students compete ferociously for places in the best high schools, with “best” defined in terms of how high schools are themselves subtly ranked according to student performance. Since most parents and students know how each high school ranks, Taiwanese academic and vocational high schools have become highly stratified by student ability and socioeconomic status (SES). Admission to high school depends mainly on student performance on the national examination, and each high school has a minimum required test score for admission. Those whose test scores fail to reach the minimum requirement for the preferred high school apply to lower ranked schools.

Due to the competitiveness of the system, parents—especially those from higher SES—seek to provide their children with shadow education through private tutoring at home or through “cram schools” that students attend after the end of the normal school day. Unlike other countries where private tutoring is more widely practiced among low-performing students for remedial purposes, private tutoring in Taiwan is more commonly used by high-performing Taiwanese students as an enrichment strategy prior to the national examinations to upper secondary education (Huang 2013). While Taiwanese pupils have made huge gains in math performance between grades 4 and 8, most of those gains accrued to children from higher SES families—likely due to the role of shadow education—which in turn has increased the heterogeneity in academic performance of junior high classrooms.

In terms of Taiwanese tertiary education, during KMT rule there were several key stages through which tertiary education transformed from an elite to a mass system (Tsai and Shavit 2007). From 1950 to 1960, the number of tertiary institutions increased from 7 to 27 as a result of the establishment of new universities and colleges, both public and private. Numerically, tertiary education expanded most rapidly in the 1960s through the explosive increase in the number of junior colleges (from 12 in 1960 to 76 in 1972), which constitute the lower tier of the tertiary education system and generally take incoming senior vocational or high school graduates about two or three years to complete. In the period from 1968 to 1985, the KMT government strongly regulated tertiary education to meet specific economic goals; for example, a student ratio of 11:9 was set for natural science, engineering, agriculture, and medicine-related departments versus the social sciences and humanities. Restrictions on private institutions were also imposed to limit the pace of system expansion and to ensure quality in university instruction (Tsai and Shavit 2007).

During the 1980s and 1990s, the state began to dismantle its highly centralized regulatory system of tertiary institutions. To meet the growing social demand for higher education, tertiary education expanded in two principal directions after the 1985 deregulation: the establishment or licensing of new institutions and, especially after 1997, the upgrading of existing institutions from the lower to the higher tier. The impact of these reforms, combined with the previous approaches to educational expansion, were profound: in 1960 the few institutions of tertiary education that existed served fewer than 7,000 students altogether, whereas by 2000 over a million students attended Taiwanese colleges and universities.

To examine the effect of this educational expansion on educational inequality, Tsai and Shavit (2007) tested a number of binary and multivariate logistic regression models on the transition to both secondary and tertiary education. In the former, they found that during the period of rapid educational expansion in the 1970s and 1980s, male advantage significantly declined in the chances of completing secondary education, though the effects of family background appear somewhat stable. In their conditional logistic regression predicting tertiary education attainment, they find persistence in not only the effect of parental education and father's class, but also strong tracking effects over time. In the multinomial regression contrasting attendance in junior colleges to that of universities, they found that 4+ year institutions (compared to the junior colleges) increased their selectivity by father's class in the most recent cohort, as well as maintained selectivity based on the type of secondary school attended. Our current research is in part motivated by the desire to improve upon the prior study in terms of the quality of data and methods used, to add a more recent cohort, to test the validity of some of the previous findings, to provide more clarity to the empirical trends established, and to do so in a comparatively meaningful way.

In contrast to Taiwan's, the Czech educational system is much more stratified, with tracking present already at the level of compulsory education. Beginning as early as the first grade (depending on the school), parents can push to have their "gifted" children placed in classes with more rigorous curricula, such as those with more intensive English instruction, sometimes for additional fees. Beginning in the sixth grade, students can attend, after completing competitive entrance examinations, elite 8-year grammar schools or *gymnasias* (as well as 6-year grammar schools beginning in the eighth grade), which are the most prestigious secondary schools in the country. Because of this, it became increasingly common in the 2000s for parents with higher SES to pay for private preparatory courses to help their fifth-grade children pass those high-stakes examinations. Strakova and Greger (2013) found that students with college-educated parents have 3 times greater odds of getting into an 8-year grammar school compared to students with less educated parents,



controlling for grades, measured ability, and elementary school characteristics. Students who fail those examinations continue in their studies at an elementary school, where they have the opportunity in the ninth grade to apply for other upper secondary schools.

The Czech system has three main types of upper secondary schools: (1) 3-year secondary vocational education schools (ISCED 3C), where girls constitute one-third of the school population; (2) 4-year grammar schools (in addition to the 6-year and 8-year grammar schools), where girls now constitute over 60 percent of the school population; and (3) 4-year technical schools (comparable to the senior vocational schools in Taiwan), which have even attendance rates by gender. Students in the vocational schools can also take 2-year follow-up studies so they can apply for tertiary education, though this pathway is not common. Academic ability varies greatly by type of school; average scores on the 2006 PISA test in reading were 603 for tenth-grade grammar school students, 522 for technical school students, and 386 for vocational school students (Greger 2012). Compared to Taiwan, tertiary education enrollment is more greatly determined by the type of secondary school attended: in 2011, 95 percent of grammar school students enrolled in tertiary education, while only 50 percent of graduates of technical schools succeeded in doing so.

Historically, the expansion of Czech tertiary education did not take place until the collapse of the communist regime in 1989, when only half of the roughly 50,000 students who applied to a university were admitted (for a more detailed overview, see Matějů et al. 2007). Before then, higher education played a relatively minor role in government policy, as it was deemed unnecessary for many occupations and played only a limited role in the centrally determined wage grid. While tertiary education was restricted, secondary education was universal: the gross enrollment rate in secondary education was above 90 percent for much of the 1970s and 1980s. With the introduction of the market economy, aspirations for and enrollment at universities expanded quickly, with particular growth in the mid-2000s (Matějů and Smith 2009). Importantly, the demand and expansion of tertiary education was accompanied by an increased demand for secondary schools providing school leaving exams (and thus the prospect to study at a university); as a result, the proportion of upper secondary school students attending vocational schools declined from over 50 percent under communism to less than 30 percent today.

In terms of their measurement of educational inequality, Matějů et al. (2007) use binary logistic regression to model the effects of parental education and father's class on the transition to complete secondary education (with school-leaving exam) and on completed tertiary education. They find that the effect of family background on both the chances of completing up-

per secondary education with a school-leaving exam and in the transition to tertiary education by father's class was generally stable from the 1960s to 1980s, which was also accompanied by stability in the educational system under those periods of communist rule. However, in the 1990s, educational inequalities increased in the transitions to both secondary and tertiary education—the former due to increased societal demand for grammar and technical schools, the latter due to the substantial decrease in the odds of children from manual worker backgrounds to achieve tertiary education. Just like the Taiwanese data, our current analysis is in part motivated by the desire to build upon the prior study in terms of the data and methods used, to make use of narrower cohort intervals, to provide more clarity to the empirical trends established, and to do so in a comparatively meaningful way.

Through this brief overview of the Czech and Taiwanese educational systems, we can observe, as a key moment of divergence, the different strategies each country took to align their educational systems to the needs of the economy. While in Taiwan this meant expanded compulsory education and a growth in the number of colleges and universities allowed, in communist Czechoslovakia—which already had an 8-year system of compulsory education in place and a nearly universal system of upper secondary education—the strategy was to support secondary vocational schools that directly connected educational instruction to the skills needed in specific state enterprises. Since the Czech system of secondary education has not been fundamentally reformed since 1989, the system remains highly stratified, though vocational schools have become less popular. While the Czech system of tertiary education has expanded since the collapse of communism, the expansion has been of a smaller scale than in Taiwan, which is due to both the lack of cost sharing by Czech students and the fact that the Czech government spends only 10 percent of its outlays on education, compared to about 23 percent in Taiwan.<sup>3</sup> How might the similarities and differences in educational systems and educational expansion shed light on trends in the inequality of educational attainment over time?

### Theory and Hypotheses

There is a long theoretical tradition, often conflicting, on the relationship between educational expansion and the equality of educational oppor-

<sup>3</sup> In the Czech Republic, there are no official tuition fees for attendance in public tertiary institutions, as the state assumes financial responsibility for all studies (however, there is a quota in place that determines the maximum number of students than can be enrolled each year under existing state subsidies). Private colleges have high tuition fees and lower prestige. In Taiwan, public tertiary institutions have tuition, but this is less than at private institutions. A low-tuition policy was first introduced by the KMT based on Sun Yat-Sen's ideology, which had the explicit aim of reducing social inequality in educational attainment. Taiwanese private institutions, without the freedom to raise tuition fees and with limited financial state support, have tended to rank lower than state institutions in prestige and quality.

tunity. In his landmark study, Mare (1981) found that in the United States the effects of family background on the highest school grade completed were stable over cohorts born during the first half of the twentieth century. He explained the stability by describing a system characterized by a dynamic equilibrium, where the growing distribution of education across socioeconomic groups (educational expansion) is counterbalanced by an increase in the importance of social background in the allocation of higher levels of education. He thus formulated a model of change in equality of educational opportunity whose parameters are not affected by the degree of educational expansion. Mare's educational transition model consists of a set of logistic response models corresponding to a sequence of transitions between grades that denote movement across the major institutional divisions of the education system.

During much of the 1980s and 1990s, Mare's transition model was the industry standard in the literature of the sociology of education. Through its repeated application, two empirical regularities were established. First, cross-national studies in a variety of countries at different levels of socioeconomic development showed persistent inequality over time, measured in terms of odds ratios in educational transitions (e.g., see the studies in Shavit and Blossfeld 1993), though other scholars have found reductions in educational inequality over time (e.g., Kuo and Hauser 1995; Jonsson et al. 1996; Breen et al. 2009). Second, recent educational attainment research indicates that the estimated effects of family background on the odds of transition from one level to the next diminish at higher levels of education (Hansen 1997).

Mare's transition model has also been contested on theoretical grounds. The transition model assumes pupils pass through a linear sequence of educational transitions, whereas in many countries, especially but not only in Europe, educational choices possible at a given transition may be path dependent on the choices made at previous points in time. Indeed, using their extended educational transition model, Breen and Jonnson (2000) argue that multinomial logistic regression can account for both horizontal and vertical stratification of an educational system and is thus a preferable option in taking into account path dependency and system diversity; they also show with Swedish data that the pathway a student has taken in his or her educational career influences the probability of making subsequent educational transitions. Alternatively, given that different countries offer a different set of educational choices throughout the educational system, the ordered logit model has a number of advantages over multinomial and binary logistic regressions for the comparative analysis of educational transitions. Using that approach, Breen et al. (2009) challenge the "persistent inequality" finding of earlier transition research by demonstrating reductions in educational inequality by family origin in eight different European countries over the course of the twentieth century. Measured in terms of the standard deviation of log odds ratios of educational attainment by family origin (drawing on the

kappa index approach in Hout et al. 1995), they find that educational inequalities from the oldest to youngest cohorts more than halved in Germany, Britain, Sweden, and Italy and almost halved in France and the Netherlands, over decades in which the educational systems in those countries expanded.

Cameron and Heckman (1998) also challenged the Mare transition model on a number of grounds, especially the problems of selection bias and the lack of time-varying covariates in the Mare model, which can lead to distorted odds ratios in the logistic regressions. They find that the declining coefficients across successive transitions in the Mare model are an artifact of the functional form of the model and selection on unobserved variables. Time-varying covariates that are not observed, such as students' measured ability at the time of different transitions, can lead to systematic bias in the estimated effects of family background variables on the probability of making successive educational transitions. Cameron and Heckman (1998) argue in favor of an ordered discrete choice model in which students choose their optimal amount of schooling (measured in years of schooling) based on the goal of maximizing the difference between the discounted costs and returns to education over time.

Returning to the relationship between educational expansion and inequality, Raftery and Hout's (1993) maximally maintained inequality (MMI) thesis stipulates that educational expansion can weaken the association between family background and education if the demand for a given level of education is saturated for students of high family background. Thus, the MMI thesis predicts that the process of educational expansion can increase the possibility of students of lower family background making a specific transition only after students of high status universally do so. If educational expansion were to reverse, or if policies aimed at promoting financial assistance to low-income students were to be reduced, the previous reduction in educational inequality can be reversed as well.

In response to that theory, Lucas's (2001) effectively maintained inequality (EMI) thesis argues that even when a given level of education is saturated for students of high family background, educational inequalities can still persist or increase, because educational systems internally diversify, through tracking or institutional prestige, thus allocating the most desirable levels of educational attainment disproportionately to students of higher family background. Tracking is in fact a major component of many educational systems, and thus the failure to include within-school tracking in the educational transition model can lead to invalid results. Responding to the criticisms of Cameron and Heckman (1998), Lucas includes time-varying covariates—school grades for a given transition year—into his model. By making different assumptions (namely that the error term was normally distributed and homoscedastic), Lucas points out that the ordered discrete choice model becomes an ordered probit model, which in his analysis incorporates three different

transitions as well as math-class tracking in the twelfth grade. Even though high school attendance is nearly universal in the United States, Lucas finds that educational inequality by family background continues to exist in the form of track placement effects, confirming the EMI thesis.

To reiterate, the second major finding in Mare (1980, 1981) was that the effect of family background declines across educational transitions, that is, that such effects would be particularly low in terms of decisions to enter graduate school. That finding has been confirmed by other scholars (e.g., Pong and Post 1990; Stolzenberg 1994; Hauser and Andrew 2006). The empirical observation lends support to the idea that parental resources (Boudon 1974) and parental socialization (Sewell et al. 1969) are the key mechanisms in the maintenance of intergenerational educational inequality. This of course does not mean that students of any family background have equal chances of entering postgraduate education, since such attendance is itself conditional on making a series of prior educational transitions strongly influenced by family background.

Finally, Alon's (2009) theoretical framework for the evolution of educational inequalities suggested that such inequalities are not only maintained but can increase or decrease depending on the degree of competition in admissions to tertiary education. When competition is fierce, upper classes may respond by adapting to changes in the school system, or by promoting exclusionary barriers in ways that seek to maintain privileged access. What is important here is that educational systems and their degree of differentiation are not causal forces in their own right, but rather frame the way social classes compete over varying degrees of scarce educational opportunities. That can apply to access to not only tertiary but also upper secondary education as well.

Given the description of the educational systems discussed above and equipped with these theoretical perspectives, we put forward several hypotheses to be tested in the subsequent sections. First, given that the Czech and Taiwanese systems of upper secondary education differ in their vocational specificity (the Czech system has more differentiated types of school, with most Czech vocational schools not providing school-leaving exams needed for university entry), we expect that the effect of family background on completing secondary education should be larger in the Czech Republic than in Taiwan across all cohorts. Because Czech grammar schools provide privileged access to tertiary education, and because seats in those grammar schools are limited, students from high-SES backgrounds would be best positioned to gain access to those seats. The institutional differentiation of secondary education in the Czech Republic can thus be seen as a system that effectively maintains inequality over time.

Second, since the expansion of compulsory education in Taiwan (beginning in 1968) also increased educational opportunities to upper secondary

education, we expect that educational inequality by family background should have declined across cohorts, for both boys and girls. This is because both types of upper secondary schools, which now have almost universal attendance, expanded greatly, and should have particularly benefited students of lower SES families. While there may be inequalities in cognitive and other skills among secondary school students by family background, such differences cannot be determined by our data.

Third, both Taiwan and the Czech Republic have transformed their systems of tertiary education from elite to mass systems, albeit at different rates and not yet reaching a point of saturation for students of upper-class backgrounds in either country. Both systems remain highly competitive and are dominated by a small number of major research universities. Since we do not have reason to believe that inequalities in tertiary education attainment should be higher or lower in either country, we anticipate that the degree of inequality by family background should be similar, and relatively stable across cohorts.

Fourth, for the Taiwanese data, we can differentiate whether respondents went to more prestigious 4+ year universities (which we call “college education”) in comparison with any type of tertiary education, including junior colleges. Since attendance in the institutions offering graduate degrees are more prestigious, we anticipate that the effect of family background should be larger on the attainment of those degrees as opposed to any type of tertiary education. Since this is an indirect way of capturing differential effects of prestige or institutional type, confirmation of the hypothesis could be seen as evidence in support of EMI.

## Data and Methods

### *Data*

Since our analytical approach is constrained by the data available, we will discuss data and variables first. For Taiwan, we use data derived from Taiwan Social Change Surveys (TSCS), which were conducted by the Survey Office at Academia Sinica.<sup>4</sup> TSCS are a series of face-to-face surveys designed to create cross-sectional data on the main themes of interest, using different representative adult samples in each survey. TSCS data were first collected in 1984–85 and have been collected annually since 1990.

For this analysis, we pool data derived from TSCS from 2000 to 2010, particularly those that contain information on parental education and father’s occupation (11 surveys: 2000I, 2000II, 2001I, 2002I, 2002II, 2004I, 2005I, 2005II, 2007I, 2009I, and 2010I). We select 5,975 men and 5,784

<sup>4</sup> Survey data and documentation can be accessed at <http://www.ios.sinica.edu.tw/sc/en/home2.php>. Aggregate educational statistics for Taiwan are available in Ministry of Education, ROC (2012).



women who were born between 1956 and 1985 and who provided complete information on the highest level of education attained, father's education, mother's education, and father's occupation when the respondent was age 15. While it would be very important to also analyze the effect of secondary school track (whether respondent attended senior high versus senior vocational schools) on tertiary education attainment, such data are only available in 4 of the 11 TSCS surveys conducted in the 2000s, and comparable data are not available for the Czech Republic (Czech social surveys almost exclusively ask about the highest education attained, and do not inquire into the type of secondary education that respondents with some tertiary education received). Therefore, this article compares the role of family background on secondary and tertiary educational attainment in the two countries but does not examine the effect of tracking or differentiation among secondary schools. The conclusion discusses the benefits of a comparative analysis of secondary school tracking, had the data been available.

We pooled Czech data for this analysis from four different surveys, which are essentially the only major recent social surveys to contain data on father's occupation and the educational attainment of both parents. The sample includes 4,408 men and 4,566 women born between 1956 and 1985 who provided complete information on the highest level of education attained, father's education, mother's education, and father's occupation when the respondent was age 12–16. We drew upon two European Social Surveys (wave 4 from 2008 and wave 5 from 2010), the ISSP Social Inequality IV survey from 2009, and the Czech 2005 EU-SILC survey, which contained information on parental education and occupation in the supplementary module on the intergenerational transmission of poverty.

#### *Variables*

We gave careful consideration to our choice of variables so that we could make comparatively meaningful analyses. In terms of dependent variables, data for both countries are based on the highest level of education attained. While it would be very desirable to have more detailed information about respondents' educational careers, such information is simply lacking for large social surveys in both countries. This leaves us with two main binary dependent variables:

1. Whether the respondent completed secondary education, conditional on having completed compulsory education. In the Taiwan case, this means having completed senior vocational or senior high school, and in the Czech case means having completed grammar school or technical school or have a school-leaving exam from another route. The common definition in both countries is that the respondent must have achieved a qualification that potentially enables tertiary education attendance.

2. Whether the respondent achieved any tertiary education degree, conditional on having completed secondary education. To ensure that we do not include respondents in tertiary education that have not yet received a tertiary education degree, we restrict our analysis to respondents age 25 years and over when interviewed.

In terms of independent variables, we consider gender (scored 1 if female, 0 if male), father's education, mother's education, father's occupation, and birth cohort. To ensure that the effect of gender is properly specified, we introduce in all of our models interaction effects between gender and each of the other independent variables.

Like education of the respondent, father's education and mother's education are measured by the highest level of education attained when the respondent was a teenager. Educational categories are recoded into years of schooling; no education = 0; self-study or incomplete primary education = 3; primary education = 5 (Czech) or 6 (Taiwan); lower secondary education = 8 (Czech) or 9 (Taiwan); Czech vocational school = 11; complete upper secondary education = 12; Taiwan junior college = 13 to 15; bachelor's degree = 15 (Czech) or 16 (Taiwan); master's degree = 17 (Czech) or 18 (Taiwan); doctoral degree = 20. While we used years of schooling to run the analysis, we then employed educational categories (low = having achieved compulsory education or less, high = having achieved some tertiary education) to contrast the predicted probability of making the grade between groups.

Father's occupational status is measured from 10 to 90 on the scale of International Socioeconomic Index (ISEI) developed by Ganzeboom and Treiman (2003). We use ISEI scores in the regression analysis first, and then employ the EGP five-class schema when contrasting the predicted probability of making the grade between the disadvantaged (low = farmer class) and the advantaged (high = professional class) under the probit model estimated.

Finally, we partitioned the analysis sample into six birth cohorts: (1) 1956–60; (2) 1961–65; (3) 1966–70; (4) 1971–75; (5) 1976–80; and (6) 1981–85, which is substantially more fine-tuned and captures more recent data than previous studies on either country.

#### *Method*

Given the data available and the theoretical discussion above, we chose binary probit as the most appropriate method. Since we do not have data on relevant transition-specific covariates, we acknowledge the potential of selection bias in our results (and see the analysis of selection bias as the next step in our future work on this topic). We prefer probit regressions because the predicted probabilities generated from them are not affected by the

identifying assumption for the variance in the error terms in a given model (Long 2009), and because the predicted probabilities are substantively useful for revealing, in a simple and graphic form, how differences in predicted outcomes vary with the level of the independent variables of interest. We thus follow Lucas (2001) and others (e.g., Holm and Jaeger 2008) in terms of analyzing how the predicted probability of passing an educational threshold is associated with differences in social background, and view this as the most appropriate way to assess the maintenance of educational inequalities.

## Results

The rapid expansion in educational attainment in Taiwan, in contrast to the more evolving Czech system, is particularly evident in figure 1, depicting the highest level of education attained by respondents across cohorts. While there has been a modest expansion in tertiary education attainment in the Czech Republic, this pales in comparison to the dramatic transformation of Taiwanese education. The different speeds of expansion in tertiary education can be explained in terms of the much higher rate of both public and private investments in education in Taiwan, as well as the presence of Czech secondary vocational programs, which limits the share of the relevant cohort in applying for tertiary education. At the lower end of the spectrum, the Taiwanese system has practically eliminated the problem of pupils terminating their educational careers with basic education, while a substantial number of Czechs continue to do so. This is in part because of the failure of the Czech system to tackle the problems of the education of Roma, who continue to face educational segregation and often drop out of the system with compulsory education or less (New and Merry 2010).

Even among the youngest 1981–85 cohort, 44.7 percent of Czech men and 32.8 percent of Czech women did not complete their education with a secondary school leaving-exam (*maturita*), a necessary precondition for entry into tertiary education. Most of these respondents attended secondary vocational (apprenticeship) programs that prepare them for specific occupations, but also lead to higher rates of unemployment due to the lack of more flexible skills needed for changing occupational careers. Taiwan, by contrast, does not have such a dead-end track, and due to its expansive secondary system, the completion of upper secondary education is almost universal among the youngest cohort for both men and women.

In terms of gender, Czech women had already achieved comparable levels of educational attainment with Czech men in the first cohort examined, such that there is no statistical difference in attainment by gender in any cohort observed in the data. While Czech educational attainment exceeded that in Taiwan in the cohorts born 1946 and 1955, reform of the Taiwanese educational system—particularly the expansion of compulsory

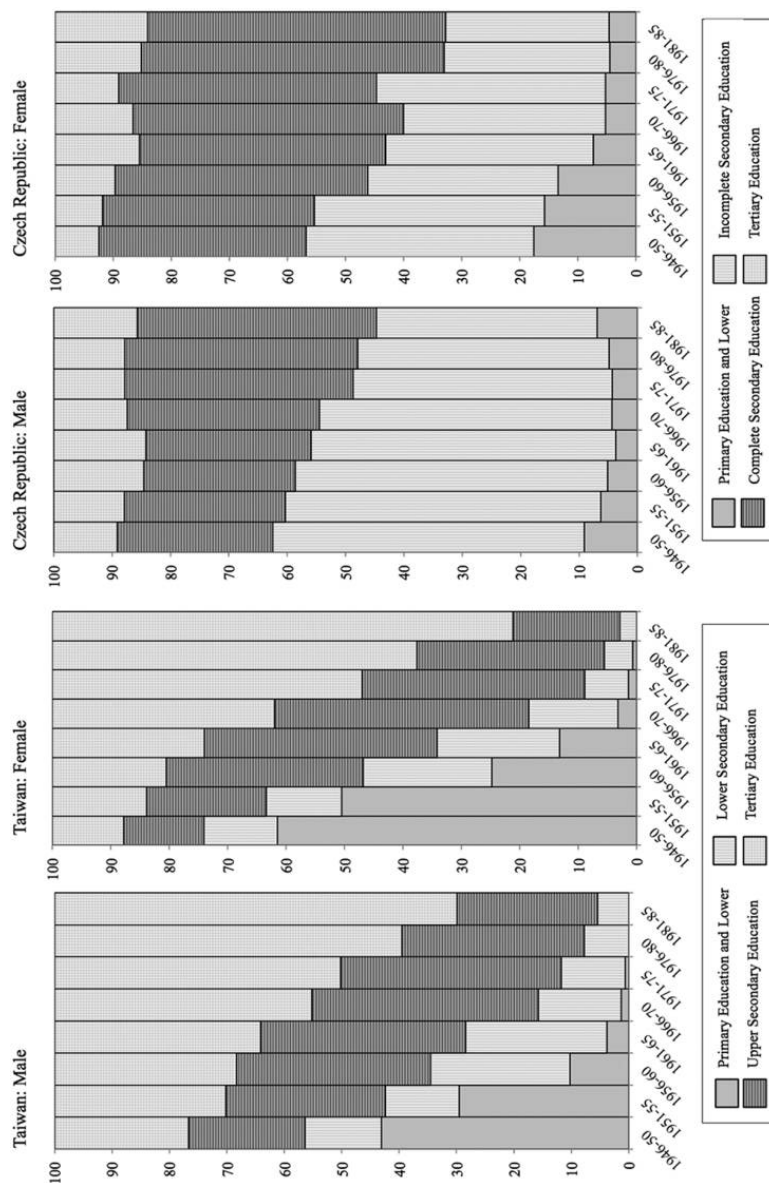


FIG. 1.—Percentage distribution of highest level of education attained by gender and cohort in the Czech Republic Taiwan and Czech Republic.

education to 9 years—quickly paid off, with Taiwanese men and women born in the years 1981–85 currently having over two years of education more than comparable Czech men and women. While there are significant differences in educational attainment among older Taiwanese, the expansion of the educational system has erased those gender differences. In the youngest cohort in both countries, there is no statistical difference in the average years of schooling between men and women.

*Educational Inequality in the Attainment of Secondary Education*

To compare the role of family background and gender on the successful completion of upper secondary education (with a qualification enabling university entry), we conducted probit regressions on completing secondary education or higher (i.e., 12+ years of schooling) for each country, conditional on having completed basic education (8 or 9 years of schooling or more). The results are displayed in figures 2 and 3, which depict the predicted probabilities of completing secondary education based on the coefficients of probit models specified in the previous section. As can be observed, the predicted probabilities of Czechs from advantaged family backgrounds are very high (typically above 80 percent) by father's education, mother's education, and father's occupation, and have remained stable or slightly increased across cohorts. While the attainment of complete secondary education is nearly saturated for students of advantaged backgrounds, particularly in the two youngest cohorts, this has *not* entailed a reduction in educational inequality by family background, as might be predicted by MMI. In fact, the differences between predicted probabilities between advantaged and disadvantaged backgrounds appear stable across cohorts and different measures of family background.

By contrast, inequalities in the attainment of complete secondary education by different measures of family background have been substantially reduced in Taiwan (fig. 3), for both men and women. The greatest reductions took place among the first several cohorts when the reform of compulsory education took effect. Again, we do not differentiate between the type of secondary school in the data (whether respondents attended senior vocational versus senior high schools), since both types of schools offer diplomas enabling access to tertiary education. However, Tsai and Shavit (2007), in measuring differences in family background in the attainment of these different educational tracks, find large inequalities between these tracks, lending greater support to EMI.

We can compare the predicted probabilities in figures 2 and 3 by measuring the size of the difference between high and low values of the measures of family background, and then comparing that difference between the two countries for each modeled situation. Those graphs can be found in the appendix to this article. With this information we can confirm our first two

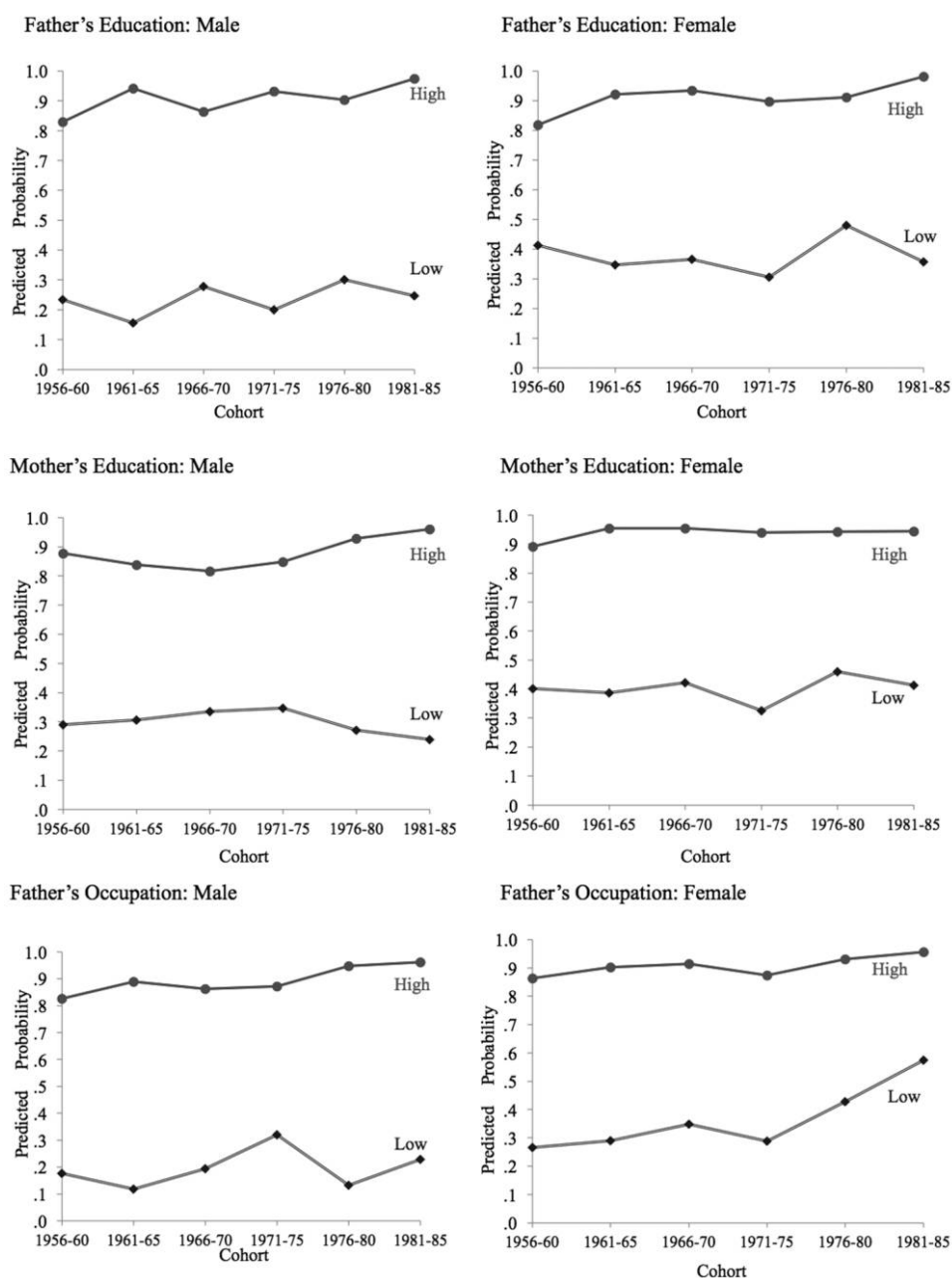


FIG. 2.—Predicted probability of completing upper secondary education (12+/8+): Czech Republic.



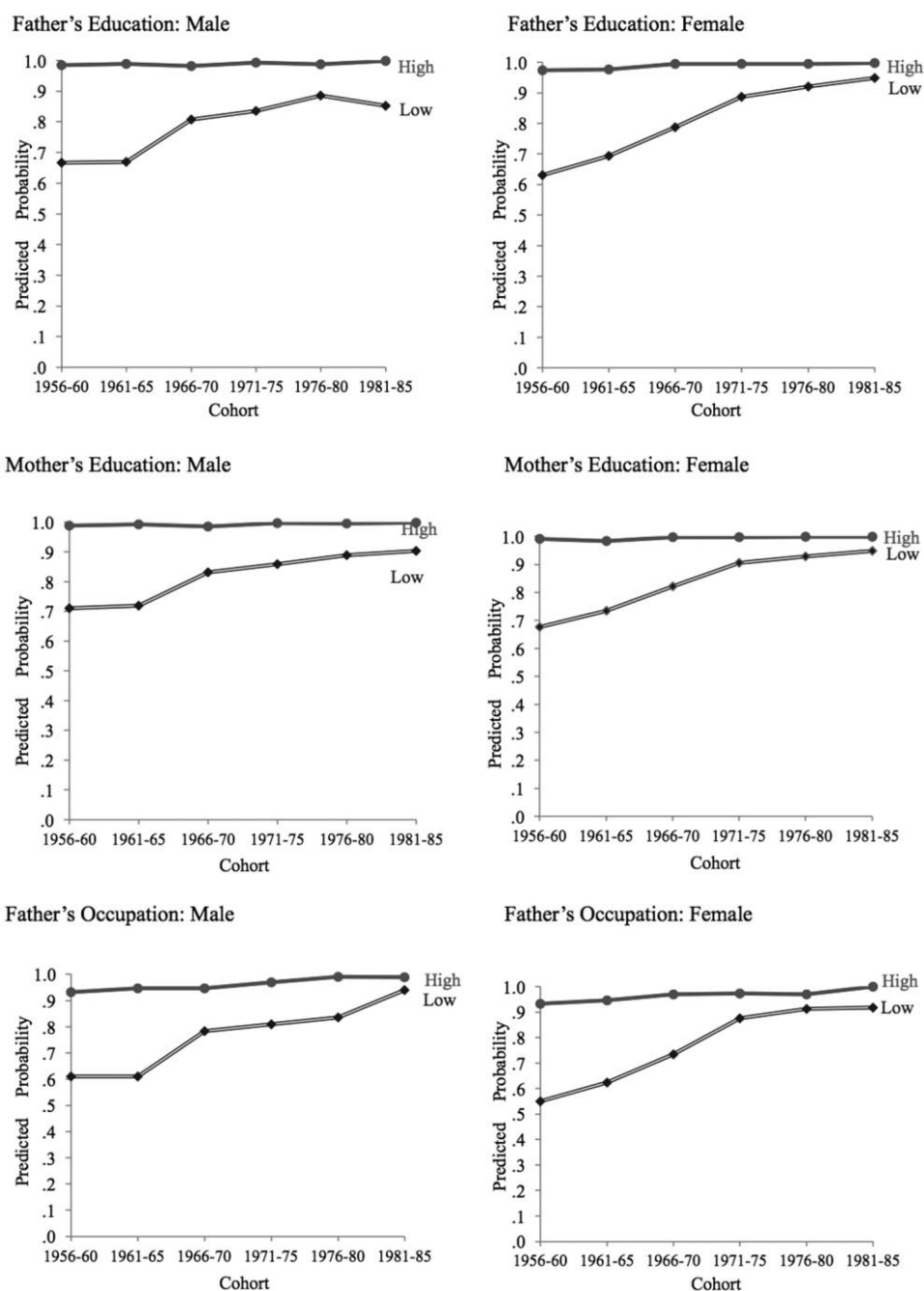


FIG. 3.—Predicted probability of completing upper secondary education (12+/8+): Taiwan

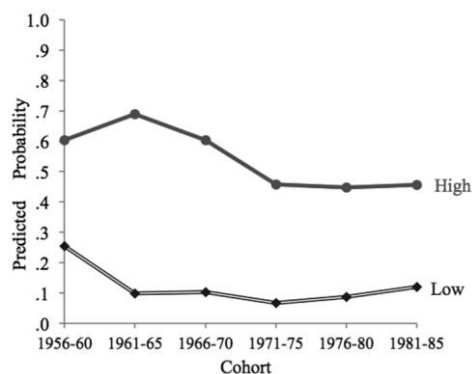
hypotheses. Our first hypothesis was that the larger degree of differentiation in the Czech secondary school system, especially in terms of the vocational specificity of that system, should produce educational inequalities by family background that are overall larger in the Czech Republic than in Taiwan. This is indeed the case. As can be observed, these inequalities in the Czech system have not only been relatively stable over time, but also persistently high in comparison to a Taiwanese system. For example, in the case of the impact of father's education on their daughters, there is only a 5 percent probability gap between the Czech Republic and Taiwan in the first 1956–60 cohort. That between-country difference gradually expanded to a roughly 60 percent gap in the 1981–85 cohort, which is due to persistent inequalities in the Czech case over time and declining inequalities in the Taiwanese case. The divergence between the Czech and Taiwanese trends in inequality in completing secondary education is similar for both genders in the effect of father's education, mother's education, and father's occupation. To reiterate, the high degree of maintained inequality in Czech secondary education is due to the scarcity of schools enabling access to tertiary education (or conversely, the presence of dead-end vocational schools), which in turn has created a fiercely competitive admissions process already in the fifth grade, when the most desirable 8-year grammar schools select incoming pupils.

We can also confirm our second hypothesis, in which we supposed that the expansion of secondary education in Taiwan, combined with the saturation of secondary education attainment among respondents of more advantaged backgrounds, would lead to a reduction in educational inequality over time. This is indeed the case, and holds true for both men and women and across the different measures of family background. That can be observed in figure 3, where the probability of completing secondary education by different measures of high family status are near 100 percent for all cohorts, while the comparable probabilities by low family status increase substantially over time, leading to a reduction in inequality between individuals from low and high family backgrounds. Since practically all pupils of upper-class backgrounds already attended upper secondary education at the time when compulsory education expanded from 6 to 9 years, that expansion of the secondary school system primarily benefited lower-class pupils.

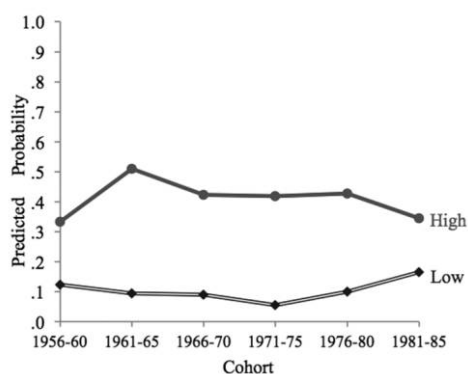
#### *Educational Inequality in the Attainment of Tertiary Education*

Similar to our analysis of completing secondary education, we also sought to analyze inequalities in the attainment of tertiary education, conditional on respondents having previously attained a secondary education degree qualifying them for the transition to tertiary education. Our methods and analytical strategy remain the same. The results of the probit regressions are graphically presented in figures 4 and 5. First, in both Taiwan and the Czech Republic, inequalities in the attainment of tertiary education by family background

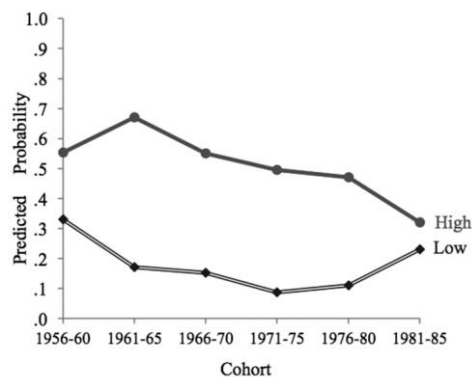
Father's Education: Male



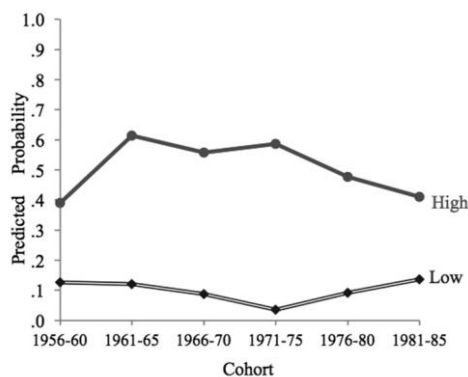
Father's Education: Female



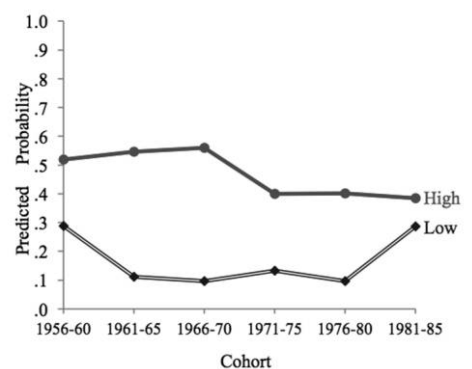
Mother's Education: Male



Mother's Education: Female



Father's Occupation: Male



Father's Occupation: Female

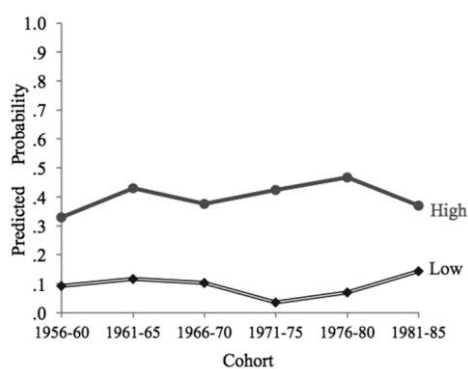
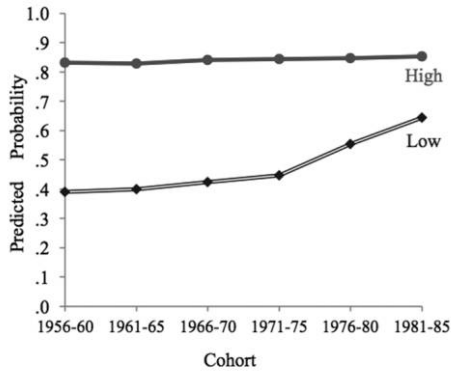
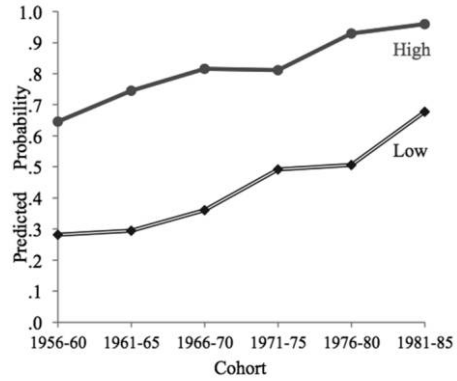


FIG. 4.—Predicted probability of attaining tertiary education (13+/12+): Czech Republic

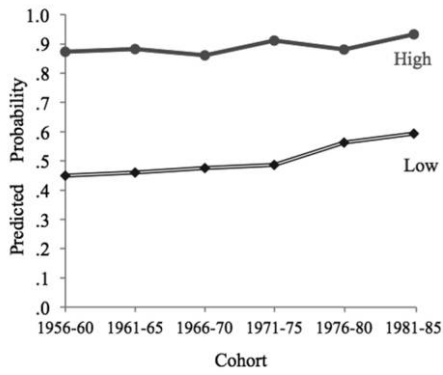
Father's Education: Male



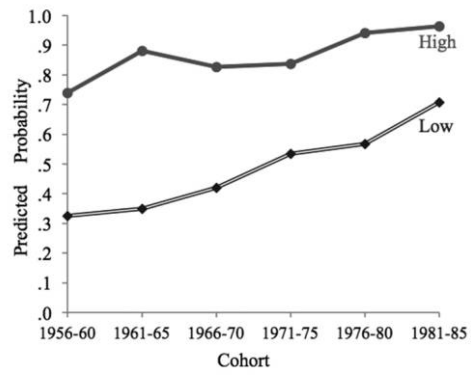
Father's Education: Female



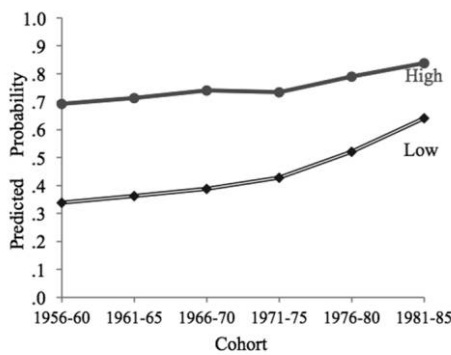
Mother's Education: Male



Mother's Education: Female



Father's Occupation: Male



Father's Occupation: Female

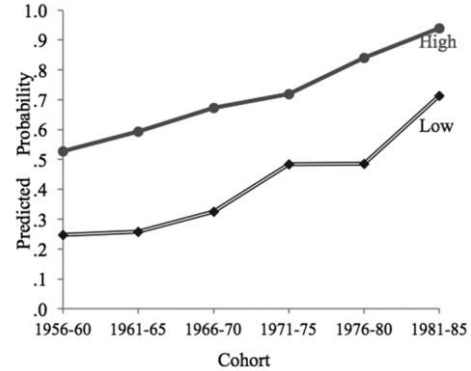


FIG. 5.—Predicted probability of attaining tertiary education (13+/12+): Taiwan

have been largely persistent over cohorts. However, in both countries we can observe a slight decrease in inequality for the most recent cohorts, depicted by their modest downward slopes on the right side of the graphs. There is consistency in these modest declines for both countries with respect to father's education, mother's education, and father's occupation. The results are consistent with the previous results of Tsai and Shavit (2007), but somewhat inconsistent with the prior results of Matějů et al. (2007), who found increases in inequality for the cohort 1990–99 (at age 18, equivalent to a birth cohort 1972–81), a time period for which our data indicate stability. The difference in results could be due to the differences in method: they compared odds ratios instead of predicted probabilities, used different data sets, compared service workers and manual workers (in contrast to our comparison of group probabilities for professional service class workers and farmers), and also examined unconditional transitions to tertiary education. Our analysis also covers an additional birth cohort (1981–85). Overall, we can observe a modest decrease in inequality in tertiary education attainment in the Czech Republic, as opposed to a modest increase, as has been reported in previous literature.

Second, our third hypothesis stated that since both systems of tertiary education have experienced expansion in recent years, and since the attainment of tertiary education by respondents of the most advantaged family backgrounds probably has not reached a point of saturation, we have little reason to expect differences in the extent of educational inequality between these countries. That hypothesis has indeed been confirmed. The differences in predicted probability across selected aspects of family background are quite similar in both Taiwan and the Czech Republic: overall, we cannot clearly say that one form of inequality at a given period of time was radically different from that of the other country, as we can in terms of secondary education attainment.

Third, in the most recent cohorts in Taiwan, the predicted probability of tertiary education attainment for respondents of the most advantaged background seems to be reaching a point of saturation. Nonetheless, at a time of near universal tertiary attainment of the most privileged, we can observe modest decreases in inequality between birth cohorts 1976–80 and 1981–85 for all three measures of family background for women, and two of the three measures for men. This seems to lend support to MMI, except that the analysis does not take into account differences in the type of tertiary education attained.

For that reason, we also conducted a probit regression of attainment of college education, involving the attainment of (at minimum) a 4-year degree and at least 16 years of education. The main form of tertiary education excluded from "college education" is education at junior colleges, which usually entails about 2 years of education beyond an upper secondary education

degree. We examine college education precisely because those programs are the most prestigious, are the most difficult to enter, and offer the best job prospects. When we compare the differences in predicted probabilities presented in figure 6, we can observe that, in the younger cohorts, the differences in inequality between the college education versus any type of tertiary education have increased. In these cohorts, inequality in the attainment of college education (compared to any tertiary education) is higher for all three measures of family background for both males and females.

The results from figure 6 also confirm our fourth hypothesis, that inequalities in the attainment of more prestigious tertiary education should be higher than in any form of tertiary education. We have found this to be correct, and in support of the EMI thesis: despite the fact that tertiary education is beginning to become “universal” among students of the most advantaged backgrounds, inequality is effectively maintained by increased inequality in the attainment of the most prestigious degrees.

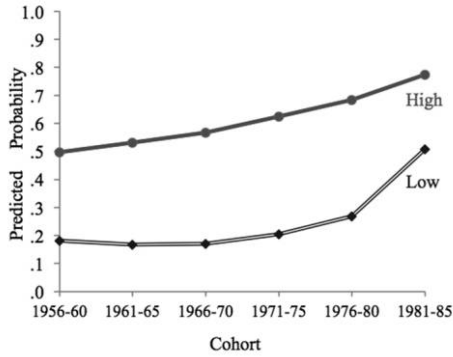
We can also observe, in the case of more recent Taiwanese cohorts, that educational inequalities increase with higher levels of educational attainment. By comparison, Czech educational inequalities in the attainment of a *maturita*, or complete secondary education with a school-leaving exam, are by far the largest among the three models analyzed, and thus represent the greatest problem for policy makers concerned with educational inequality in the Czech Republic.

## Conclusion

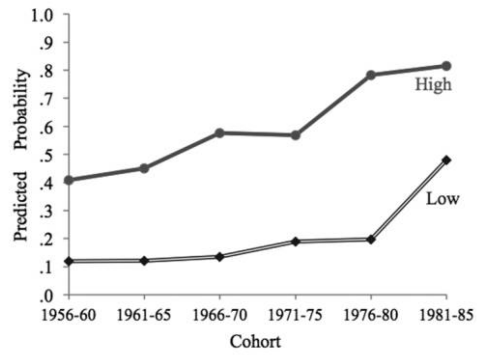
In this article, we have sought to provide a comprehensive overview of inequalities in educational attainment by family background in Taiwan and the Czech Republic. We aimed to improve upon previous studies by pooling larger and more recent data sets, by detailing the effect of family background by specific indicators, and by using a standard method for measuring inequality across two quite different educational systems. We aspired to compare educational inequality in Taiwan and the Czech Republic because of the interesting similarities and differences in both the educational systems and educational expansion. While much has been written on tertiary education expansion in the Czech Republic, we can see in comparative perspective that such expansion is quite modest, not only due to the low levels of private and public spending on tertiary education, but also because of the large number of Czechs who do not have a school-leaving exam, and thus have limited options to upgrade their skills. The introduction of junior colleges like those in Taiwan may remedy this in the Czech Republic, but as our analysis shows, the introduction of such colleges would probably not reduce educational inequalities in the Czech system without commensurate reforms at the secondary level.



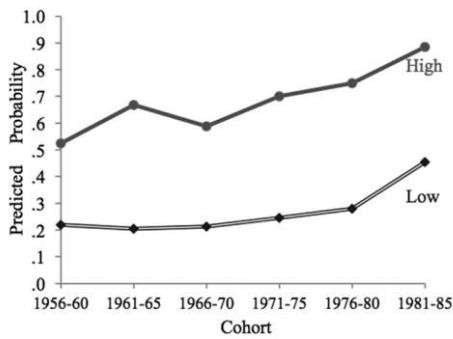
Father's Education: Male



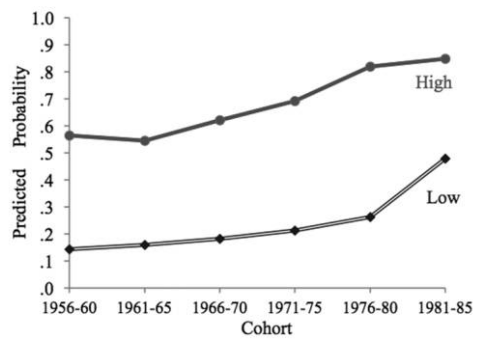
Father's Education: Female



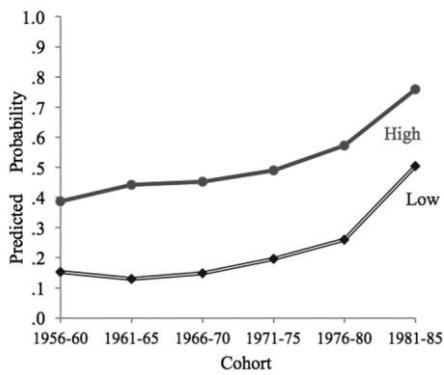
Mother's Education: Male



Mother's Education: Female



Father's Occupation: Male



Father's Occupation: Female

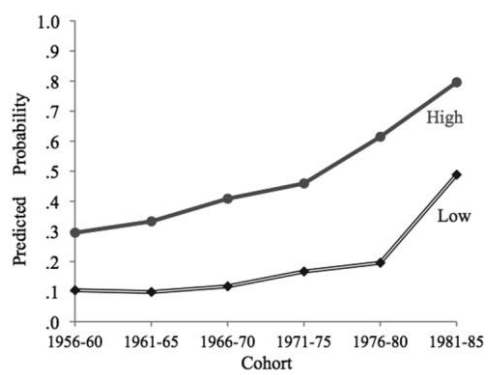


FIG. 6.—Predicted probability of attaining college education (16+/12+): Taiwan

The results of our analysis are straightforward. First, we confirmed that the presence of dead-end tracks in secondary education in the Czech Republic has contributed to the persistence in educational inequality, especially in contrast to the Taiwanese case. Despite the fact that over 90 percent of Czech teenagers attend some form of secondary education, inequalities in the attendance of schools providing school-leaving exams (and thus the possibility of university attendance) have been effectively maintained. Overall, we can say that the high degree of secondary school differentiation in the Czech Republic is the primary barrier preventing the reduction of educational inequality in the school system as a whole. Despite this, there have been very few calls by policy makers to reform the system; quite to the contrary, the societal need for skilled manual workers is frequently evoked as a justification for maintaining the status quo. High SES families also benefit from the status quo by placing their children in the most prestigious academic and technical schools, and so they are generally concerned that any reforms at that level (including increasing the share of pupils in those schools) would lead to a downgrade in the quality of education for their children (Strakova and Greger 2013).

Second, we hypothesized that the expansion of secondary education in Taiwan, combined with the saturation of secondary education attainment among respondents of more advantaged backgrounds, would lead to a reduction in educational inequality over time. This is indeed the case, and holds true for both men and women and across the different measures of family background. While there are class differences in attainment of the two types of upper secondary school, both types of school provide similar access to tertiary education programs. Given that Taiwan was a front-runner in the expansion of secondary education in the East Asia region, it would be interesting to see if declines in educational inequality will follow suit in neighboring countries with a similar institutional setup, particularly mainland China.

Third, we have found little in the way of differences in inequality of tertiary educational attainment in Taiwan and the Czech Republic over time. These results make sense to us, as both systems continue to expand (at their own paces), and that Taiwan is only now beginning to reach a point of saturation in attainment by students of the most privileged backgrounds. It will be fundamental to observe how these inequalities change in Taiwan in future cohorts. Finally, when we differentiate more prestigious tertiary education from overall tertiary education, we can see that inequalities are much larger across the board. This result, along with the confirmation of our second hypothesis, suggests that both countries have educational systems that more directly reflect the predictions of effectively maintained inequality.

This study has aimed to contribute to research on educational inequality in a number of ways. The first is in terms of research design. While cohort-based trends in educational inequality across countries have been reported

in numerous studies (e.g., Breen et al. 2009), research on the mechanisms that could explain those trends rely heavily on single-country analyses (e.g., Shavit and Blossfeld 1993; Erikson and Jonsson 1996). By contrast, we believe that a comparative case study design involving typical countries from two distinct types of educational systems is useful for highlighting how the presence and absence of specific educational mechanisms—such as dead-end tracks in secondary school—contribute to that inequality, while maintaining the contextual detail needed to understand those mechanisms in practice.

Second, instead of focusing only on inequality by family background in either secondary or tertiary education, our study has revealed the value of honing in on their interconnection. The observation of trends in equality in the attainment of tertiary education should be seen in the context of the degree of inequality at the secondary level, since in many countries students of disadvantaged backgrounds are often filtered out of the educational system well before the opportunity to apply to a college or university even arises. This is important for understanding where bottlenecks occur: the much higher degree of inequality in the attainment of Czech secondary education compared to tertiary education, for example, points to the fact that addressing educational inequality needs to focus much more on the former, such as by increasing the pathways for pupils of disadvantaged backgrounds to attain a school-leaving exam.

Third, more educational opportunity does not necessarily entail less inequality. The composition of secondary and tertiary education—for example, the degree of standardization of school curricula, or school types and their stratification by social origin and not just the volume of education—are of critical importance. The dramatic reductions in inequality in Taiwanese secondary educational attainment directly followed policy interventions expanding compulsory education, and the schools needed to accommodate pupils from largely lower-class families. However, such policy effects likely would not have been observed had the secondary school system been as differentiated as the Czech one.

These findings need to be placed in the context of our research limitations. For example, we focused on measures of parental background that can be standardized and available across both countries and all cohorts (parental education and father's occupation) and did not examine the role of other important country-specific factors, such as ethnicity. In terms of the latter, the Czech Republic is currently under international scrutiny for its systematic discrimination of Roma pupils (New and Merry 2010), who are often segregated from Czech pupils and face very limited educational prospects. Those inequalities should be seen as additional, rather than incorporated within, the inequalities reported in this article, because Roma are underrepresented in Czech survey data (they disproportionately live in institutionalized housing units that are excluded from sample frames), and many

attain, at most, compulsory education and thus do not even enter the upper secondary schools examined here.

Another limitation of our analysis is that we cannot observe variations in the attainment of cognitive and other skills of students of different family backgrounds. Unobserved differences in cognitive and noncognitive skills by family background could lead to biased estimates of the effect of family background on educational attainment. Unfortunately, such data on cognitive and noncognitive skills are typically available in only specialized cross-sectional data sets that are ill-suited for the kind of detailed cohort study carried out here.

Finally, our study is also limited in that it was not possible to examine the effect of school tracking (as opposed to academic credentials) in upper secondary schools in either country, as such data simply are not available across the breadth of cohorts studied. Further research on educational inequality would benefit from the systematic and consistent collection of educational history data as a core background component of major cross-sectional and panel surveys in these countries. If data about secondary school tracks were available, we would be able to address three questions: To what extent does family background predict high school tracks? To what extent do family background and high school tracks predict the completion of tertiary education? And to what extent do high school tracks mediate the effects of family background on the completion of tertiary education? Addressing these questions would help us understand the role high school tracks play in shaping educational inequality and the way family background affects educational attainment.

While we do not have data for high school tracks, we do know that the Czech Republic, like other countries with the German model, is characterized by a highly differentiated system of secondary education that offers vocational programs that do not lead to credentials needed for tertiary education. Such an institutional characteristic, we suggest, is likely to lead to persistent inequality by family background in completing secondary school education, even in the face of educational expansion.

## Appendix

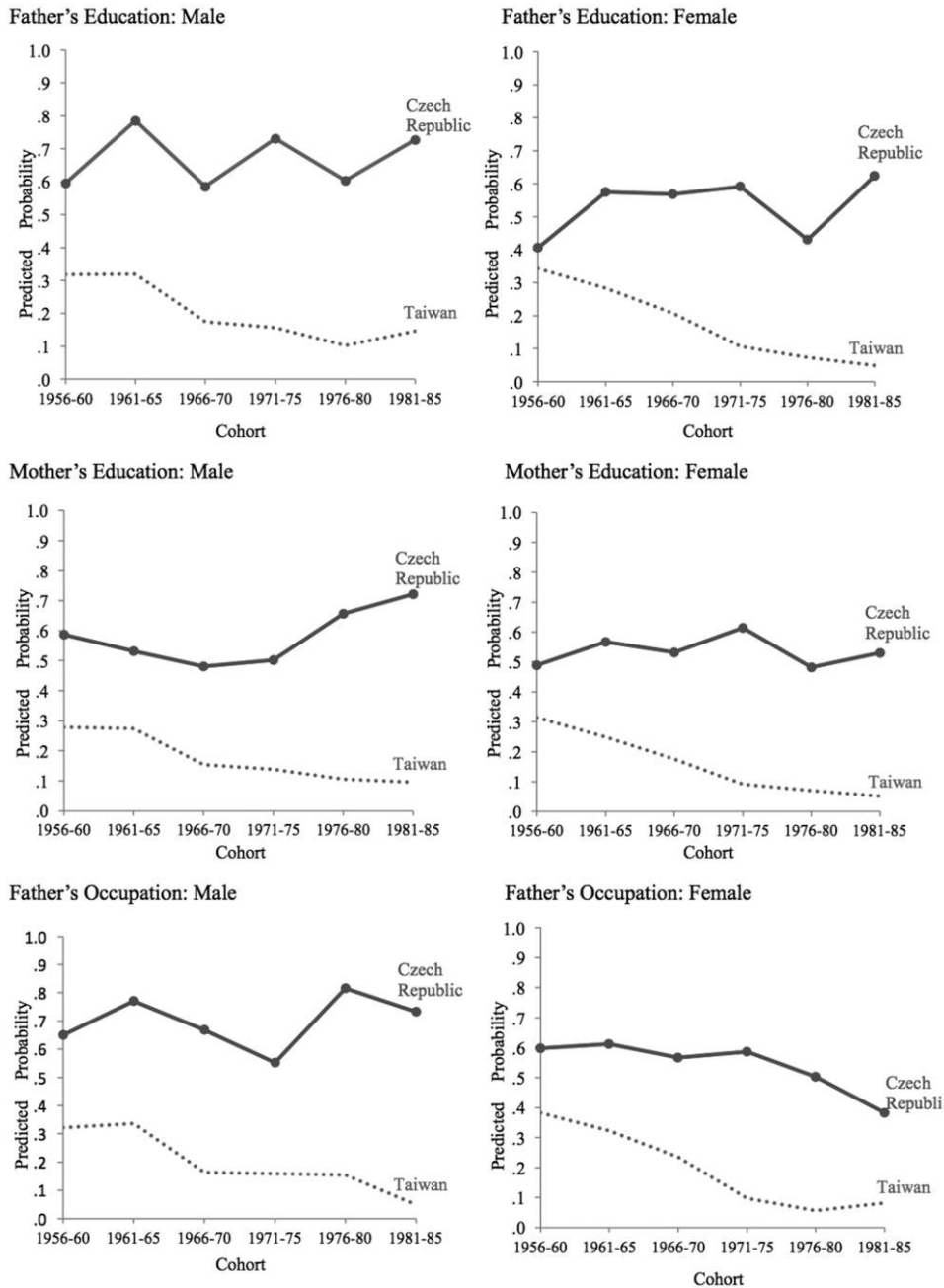
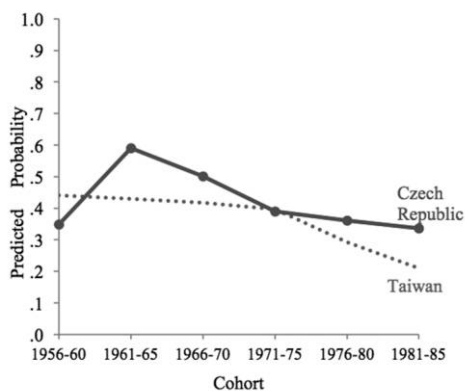
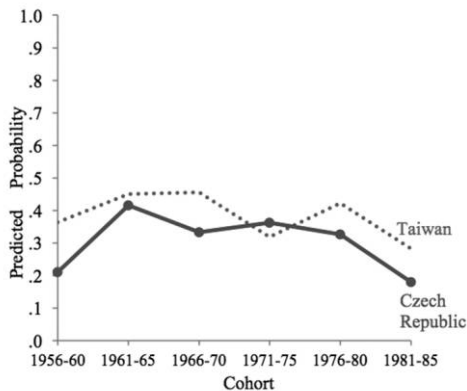


FIG. A1.—High-low differences in the probability of completing secondary education

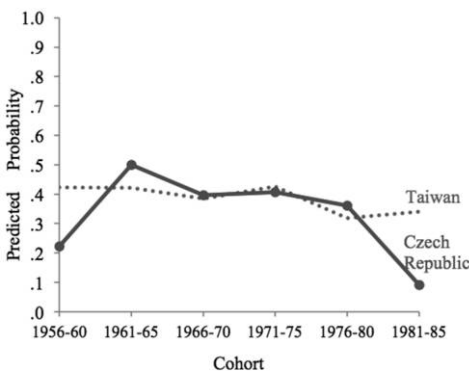
Father's Education: Male



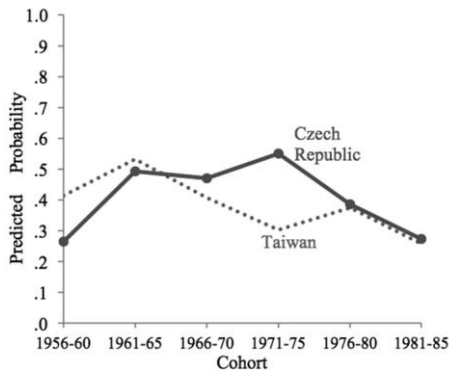
Father's Education: Female



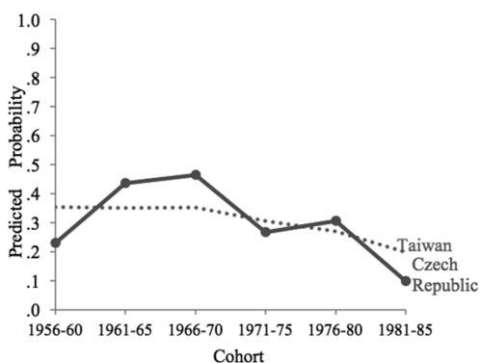
Mother's Education: Male



Mother's Education: Female



Father's Occupation: Male



Father's Occupation: Female

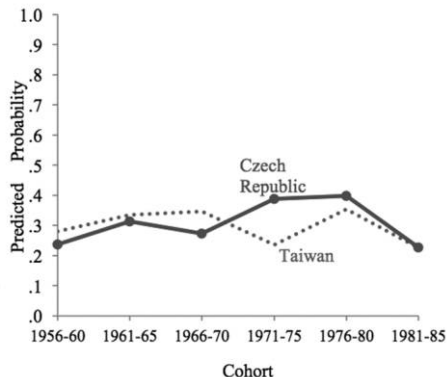


FIG. A2.—High-low differences in probability of attaining tertiary education in Taiwan and the Czech Republic (13+/12+).



TABLE A1  
AVERAGE YEARS OF SCHOOLING BY GENDER AND COHORT IN THE CZECH REPUBLIC AND TAIWAN

Birth Cohort	Male			Female			Diff. <i>t</i> -test
	Mean	SD	<i>N</i>	Mean	SD	<i>N</i>	
Czech Republic (Total <i>N</i> = 8,974):							
1946–50	11.30	2.28	650	10.99	2.17	765	2.546
1951–55	11.44	2.27	651	11.11	2.20	726	2.736
1956–60	11.64	2.40	553	11.38	2.22	551	1.860
1961–65	11.71	2.30	519	11.81	2.33	545	−.667
1966–70	11.62	2.12	562	11.84	2.13	580	−1.753
1971–75	11.67	2.13	581	11.66	2.14	617	.027
1976–80	11.59	2.04	674	11.99	2.08	586	−3.453
1981–85	11.93	2.14	218	12.26	2.12	195	−1.574
<i>Total</i>	11.58	2.22	4,408	11.54	2.21	4,566	.843
Taiwan (Total <i>N</i> = 13,441):							
1946–50	09.69	4.094	685	07.68	4.261	669	8.85 <sup>a</sup>
1951–55	10.79	3.881	1,009	08.76	4.207	1,027	11.32 <sup>a</sup>
1956–60	11.68	3.234	1,172	10.34	3.672	1,125	9.27 <sup>a</sup>
1961–65	12.23	2.886	1,133	11.39	3.130	1,154	6.67 <sup>a</sup>
1966–70	12.95	2.599	1,010	12.60	2.644	1,041	3.02 <sup>a</sup>
1971–75	13.35	2.519	909	13.36	2.331	875	−.09
1976–80	13.91	2.405	650	13.92	2.322	604	−.07
1981–85	14.67	2.398	204	14.87	2.054	174	−.87
<i>Total</i>	12.16	3.381	6,772	11.20	3.891	6,669	15.26 <sup>a</sup>

<sup>a</sup> Significant at the level of  $\alpha = .05$ .

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