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ABSTRACT

Human Capital Investment under Exit Options: Evidence from a Natural Quasi-Experiment*

Theory suggests that groups historically subject to discrimination, such as Jews, could exhibit traditionally high investment in education because discrimination spurred exit facilitated by human capital. Theory moreover suggests that if exit is uncertain, it could induce investment in skill that more-than-offsets the mechanical reduction in skill stocks at the origin. Tests of such theories are difficult and few. We examine a unique natural quasiexperiment in the Republic of Fiji, in which a sharp increase in discrimination induced mass exit by one ethnic group and mass skill investment by the same group. We show that the induced investment more than offset the loss from exit, producing a net increase in skill stocks. We argue with theory and a range of nonexperimental falsification tests that exit by skilled workers was a necessary causal mechanism of the offsetting skill investment.

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Why do some social groups, and even nations, invest less in education than others? The canonical model implies that people invest less, all else equal, if the local returns are lower (Schultz 1961; Becker 1962). But this could change under the option of exit to another place where the returns are higher. Lower returns due to local discrimination, for example, could shift investment toward the portable capital of education, along with migration to realize higher returns elsewhere. This theory has been advanced as a partial, controversial explanation for traditionally high investment in education by the Jewish diaspora (e.g. Stigler and Becker 1977; Brenner and Kiefer 1981).

Theory moreover suggests that if the exit option is uncertain, the local increase in human capital due to induced investment could offset the mechanical reduction due to exit (Mountford 1997; Stark et al. 1997). Even locally, then, lower returns could leave human capital stocks unchanged or even increase them. Direct tests of these theories are difficult and few.

This paper presents a rare natural quasi-experiment to test the effect of an exit option on the response of education investment to a sudden change in the returns to education. This occurred in 1987 in a small low-income country, the Republic of the Fiji Islands. In the mid-1980s, its population was evenly divided between Fiji Islanders of indigenous origin (*Fijians*) and Fiji Islanders of South Asian origin (*Indians*).[1] In 1987, Fijian military officers carried out two unexpected and largely bloodless coups d'état. The new government changed the constitution and enacted a series of measures that many Indians perceived to permanently harm their prospects for economic advancement in the country. We test the effects of this incident using uncommon full-universe census microdata from Fiji.

We present quasi-experimental evidence that this sharp increase in discrimination against Indians 1) caused one of the largest, fastest emigration waves on record, predominantly by skilled Indians, and 2) caused an offsetting wave of skill investment by Indians, so large as to produce a domestic *rise* in skill stocks net of skilled emigration. We present non-experimental evidence,

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[1] 'Fijian' and 'Indian' denote ethnicity, not citizenship. To reflect standard practice in Fiji, including in official data sources, we herein use the word 'Fijian' to denote indigenous Fiji Islanders of the Fijian ethnicity (usually excluding Rotumans and other indigenous people not strictly Fijian) and the word 'Indian' or 'Indo-Fijian' to denote Fiji Islanders of South Asian descent (at the time that most of their ancestors arrived in Fiji, 'India' included present-day Pakistan and Bangladesh). While a tiny portion of the population claims mixed ethnicity, intermarriage between the groups is extremely rare.

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framed with a simple model, that the first of these effects was a necessary causal mediator for the second—that is, that the possibility of exit by skilled Indians caused a rise in the domestic stock of skill among Indians net of departures. We offer falsification tests of a range of alternative causal models. For example, we find that the offsetting skill investment in the home country cannot be explained by pre-trends, remittances, unemployment, or a rise in types of education incompatible with emigration.

The paper contributes a rare test of theories important to the human capital investment model of educational attainment, with plausible causal identification. A long literature has considered groups such as Jews or Asian-Americans, whose migration has often been spurred by ethnic discrimination (e.g. Boustan 2007). A strand of that work explores the theoretical origins of their relatively high educational investment. That work debates the relative roles of discrimination with exit options, maintenance of minority identity and cohesion, or exogenous cultural tastes (Veblen 1919; Kuznets 1960; Kahan 1978; Chiswick 1988; Botticini and Eckstein 2005, 2007; Bénabou and Tirole 2011; Becker et al. 2018). This literature has not directly examined a change in discrimination with exit options to observe resulting changes in group-level propensity to invest in education. The theoretical possibility for discrimination to raise education investment through the exit option channel is an important qualifier to recent work finding that *anti*-discrimination policies raise education investment (e.g. Bagde et al. 2016).

This work furthermore contributes to the literature on the direct effect of exit options on human capital investment, where theory generally outstrips evidence (Dustmann and Glitz 2011). While an older wave of theories stressed the depletion of human capital by emigration (Bhagwati and Rodríguez 1975), more recent models stress the interrelationship between such depletion and additional investment spurred by migration prospects (Docquier and Rapoport 2012; Djajić et al. 2018). A macro empirical literature has measured a conditional positive relationship between skilled emigration and skill formation across developing countries, facing challenges of strict causal identification inherent to cross-country data (Beine et al. 2008, 2011).

A related micro literature has tested whether a high expected return to human capital abroad affects potential migrants' education investment in the home country, but not whether an exogenous change in migration itself caused a net rise or fall in human capital. Batista, Lacuesta and

Vicente (2012), conducting a custom-built survey in Cape Verde, find that a 10 percentage-point rise in the probability of future migration causes a four percentage-point rise in the probability of intermediate school completion before migration. Shrestha (2016) finds that a sudden increase in education requirements for Nepalese *Gurkha* recruits into overseas British Army service caused an increase in the average education of men in Nepal net of emigration.[2] Other recent work on the effects of migration on education has focused on how migrant remittances alleviate capital constraints on schooling investment, not how migration prospects alter the returns to that investment (Yang 2011; Gibson, McKenzie and Stillman 2011; Bryan, Chowdhury and Mobarak 2014; Dinkelman and Mariotti 2016; Theoharides 2018).

The paper begins by describing the natural quasi-experiment in Section 1. Section 2 presents quasi-experimental estimates of the effects of a shock to discrimination on skilled emigration and domestic skill stocks. Section 3 presents a simple model in which the exit option for skilled emigrants is a necessary causal mediator for a net positive effect of discrimination on domestic skill stocks. Section 4 presents a range of non-experimental falsification tests that corroborate the model, Section 5 circumscribes the external validity of the results, and Section 6 concludes.

1   A natural quasi-experiment in the Pacific

In 1987, the Republic of Fiji was a lower-middle income country, one of the largest developing economies in the Pacific. Its population of 722,000 was comparable in size to Cyprus or Gabon, its GDP per capita of PPP$4,980 comparable to the Dominican Republic or Tunisia. The population of Fiji was split roughly evenly between the two main ethnic groups: Fijians and Indians. At odds with the experience of the Indian diaspora in many African countries, Indo-Fijians had levels of average income, health, and basic education that were similar to those of their indigenous Fijian counterparts (Table 1). Most Indo-Fijians are descended directly from penniless, and mostly illiterate, indentured laborers who arrived between 1879 and 1917 and have never been richer on average than ethnic Fijians.[3]

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[2]In settings where migration is often for low-skill but relatively high-wage work, tending to reduce the relative return to investments in education, migration has been found to reduce education investment at the origin (McKenzie and Rapoport 2011; De Brauw and Giles 2017; Pan 2017).

[3]Recruitment of Indian indentured laborers stopped in 1917 and the indenture system was abolished in 1920 (Gillion 1962, 188).

In 1987 began a series of essentially bloodless military coups d'état by the Fijian-dominated army. In April of that year, an election ousted the administration of indigenous chief Ratu Sir Kamisese Mara, whose Alliance Party had ruled since independence. Timoci Bavadra's Fiji Labor Party, which held widespread support among Indians, took power. On May 14th, Lieutenant Colonel Sitiveni Rabuka of the Fiji army escorted Bavadra out of Parliament and seized control of the government. This coup détat was not widely expected and came as a shock to most of the population (Lal 2008). A second coup by Rabuka followed in September, consolidating the power of the new government and returning Ratu Mara to the post of prime minister.

The post-coup government profoundly changed the landscape of public policy in Fiji. This "overtly racist military takeover" (Tavola 1990, 170) enacted a range of new affirmative action policies for ethnic Fijians, modeled directly on similar policies enacted years earlier in Malaysia. Many Indians perceived Fiji's new rules to permanently disadvantage them relative to their indigenous counterparts. These policy changes included the following:

- *Politics*: A new constitution in 1990 guaranteed a permanent Fijian majority in the parliament and limited Indians to hold at most 27 out of 70 seats (Robertson 2006). A minimum of half the positions in the public service were reserved for indigenous Fijians, as were the positions of prime minister and president. The armed forces remained predominantly Fijian, as they had been since independence. At several ministries and in the police force, the years after 1987 saw large increases in the fraction of staff who were Fijian, resulting in large Fijian majorities (Sharma 1997, 88–91).

- *Business*: In 1992, FJ\$20 million in public funds were granted to Fijian-owned businesses through Fijian Holdings Limited. The annual number of publicly-subsidized loans to Fijian-owned firms through the Fiji Development Bank roughly tripled after 1988, and their terms were made more concessional (Ratuva 2002; Gounder and Prasad 2005). In 1990, the Fiji National Provident Fund created the Small Business Equity Scheme, which over the next decade paid out over FJ\$17 million to business owners—roughly 90% of whom were Fijian (Ratuva 2002).

- *Housing*: In 1987, the Fiji National Provident Fund set up the Village Housing Scheme to provide grants for housing in rural villages. This was part of the post-coup affirmative

action package and the large majority of beneficiaries have been Fijians (Ratuva 2002; Fiji Human Rights Commission 2006, 88). As of 2005 the scheme had granted over FJ$100 million (Parliament of Fiji 2005).

- *Labor*: A series of new laws in 1991 sought to liberalize the labor market by weakening labor unions and other trade associations. These affected Fijian workers as well, but many unions were Indian-dominated, and "unions with a predominantly Indo-Fijian membership base—like the National Farmers Union—were specifically targeted" (Chand 2000, 173).

- *Land*: Upon independence from Great Britain in 1970, Fiji retained colonial laws reserving all but eight percent of land for Fijian or government ownership (Ward 1995). For several years thereafter Indians lobbied to relax this restriction, without success (Kunabuli 1990). The coups in 1987 convinced many Indians that limitations on their land ownership were unlikely to change (Prasad 2008).

- *Higher education:* Shortly before the coups, in 1984, the government created a FJ$3.5 million fund for education in Fiji. A large portion of this was directed to the Fiji Affairs Scholarship Scheme—higher education scholarships available only to Fijians (Sharma 1997, 111). The post-coup government raised this fund to FJ$4.5 million in 1987, then to FJ$5 million in 2001, and to FJ$8 million by 2006 (Sutherland 2000, 207; Puamau 2001; Fiji Human Rights Commission 2006, 88). In the years after 1987, funding for public tertiary scholarships available to Indians declined (Kumar 1997, 85). In 1989, the government overturned its longstanding rule of splitting tertiary scholarships evenly between Indians and Fijians, and allotted scholarships in a manner "heavily weighted" toward Fijians (Tavola 1991, 55). For decades thereafter, Indians were restricted to hold a maximum of 50% of government scholarship awards regardless of qualifications, and scholarships available to Indians were means-tested while those available to Fijians were not (Puamau 2001; Fiji Human Rights Commission 2006, 88; Vallance 1996, 100). Many publicly funded tertiary training institutions, such as the Fiji College of Advanced Education, became legally required to admit a substantial Fijian majority in each entering class.[4]

- *Security*: Late 1989 saw several incidents of arson against Hindu, Muslim, and Sikh places of worship, allegedly by Methodist extremists in the indigenous Fijian community. In-

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[4]Data provided by the Students Management System, Fiji College of Advanced Education.

dians' fears that the Fijian military junta may not protect them from violence sparked a nationwide Indian strike (Tavola 1990, 175).

While some of this discrimination was eased by a new constitution in 1997, another coup followed in 2000. The 1997 constitution was suspended, and feelings of insecurity among Indians intensified again. The new coup had much in common with the events of 1987. In both years, "coups had occurred in the wake of election victories by predominantly Indian-backed political parties. ...Each time, takeovers had been carried out in the name of upholding 'indigenous paramountcy'" (Fraenkel 2007, 422). A fourth coup, in 2006, differed in fundamental respects from the others, but occurred outside the period analyzed here.

2   Quasi-experimental results: Effects on exit and skill stock

This sudden rise in legal discrimination sparked an Indian exodus (Narayan and Smyth 2003). "Fear among Indians became widespread and those who were able made every attempt to emigrate" (Tavola 1990, 169). The principal destination country was Australia, followed by New Zealand and Canada. Most of those who could qualify for visas to these countries were skilled workers and their families. It is one of the largest, fastest migrations by a group of skilled workers on record.

The Indian population of Fiji, which had grown in tandem with the Fijian population for generations, began to plummet. Over the next 20 years, the Indian population fell in absolute terms, as emigration removed roughly one third of the Indian population relative to counterfactual growth of the Fijian population (Figure 1a). Data on net departures compiled by Fiji confirm that the vast majority of these additional migrants were Indian (Figure 1b). The vast majority were also skilled workers and their families, confirmed by data on settler visas issued by Australia—the leading destination country—to Fiji-born immigrants (Figure 1c).

The evidence in Figure 1 suggests a reasonable prior: that the sharp rise in discrimination in 1987 sharply depleted skill stocks in Fiji by causing a mass exodus of skilled workers. But a simple differences-in-differences analysis reveals no such net depletion.

The absence of Indian relative skill depletion is apparent in Table 2. The upper pane of the table counts the Fiji-born in the three main migrant-destination countries, by ethnicity, just before the coup (1986) and nine years after it (1996). It separately counts Fiji-trained skilled emigrants from Fiji, defined as people with tertiary attainment born in Fiji who arrived in the destination country at or after age 20. The number of ethnically Fijian skilled emigrants to all three destinations rose by only 483 in the decade after the coup. The number of ethnically Indian skilled emigrants rose by 5,885.

The difference-in-difference (Indian v. Fijian, post- v. pre-coup) shows that this emigration tended to *mechanically* reduce the skilled fraction of Fiji's workforce by 3.08 percentage points. This is a very large effect, given that the pre-coup skilled fraction of the collective Indian-or-Fijian workforce was just 4.32 percent.[5] But this mechanical reduction in Indian relative skill stocks did not produce a *net* decline in Indian skill stocks, as shown in the bottom pane of Table 2. The skilled fraction of the Indian workforce inside Fiji *rose* relative to the Fijian workforce over the same period. The difference-in-difference in skilled fraction inside Fiji (Indian v. Fijian, post- v. pre-coup) is +0.341 percentage points.

Figure 2 shows the same differences-in-differences analysis graphically. Figure 2a shows skilled Fiji-born, Fiji-trained workers abroad by ethnicity, as a fraction of each ethnicity's workforce back in Fiji. Figure 2b shows skilled workers inside Fiji as a fraction of the same denominator used in Figure 2a: the size of each ethnicity's workforce inside Fiji. It is visually clear that if the sharp difference-in-difference in Figure 2a had a first-order effect on domestic skilled-worker stocks, the trends in Figure 2b would have converged and crossed, as emigration relatively depleted the number of Indian skilled workers. Instead, the trends in Figure 2a are nearly parallel, slightly diverging.

This result does not arise spuriously from pre-coup trends. Figure 3 shows the Indian-Fijian difference in tertiary attainment fraction by age cohort in full-universe Fiji census microdata, just before the coup (1986). The horizontal axis is the expected year for each cohort to turn 18: thus '1986' shows people age 18 at the time of the 1986 census, '1985' shows people age 19 at the time of the census, '1984' shows people age 20, and so on. In the cohorts coming of age in years

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[5]From the last four rows of the table: (5,043 + 9,160)/(155,015 + 173,842) = 0.0432.

prior to the coup, the Indian-Fijian gap had remained stable around three percentage points. There is no sign of divergence between the two groups before the coup; if anything, there was convergence for younger cohorts.

The same figure superimposes an identical calculation from full-universe Fiji census microdata a decade after the coup (1996). The horizontal axis again represents cohorts by the expected year of turning 18, meaning that observations from the two censuses that are horizontally aligned with each other mostly represent the same people. Two features are notable. First, the Indian-Fijian gap in tertiary attainment soars after the coup, exceeding 11 percentage points for those turning 18 in 1996. This striking break with the previous, stable gap between the two ethnic groups indicates a large wave of new investment in education relatively concentrated among Indians. Second, the cohorts in which the 1986 gap exceeds the 1996 gap indicate the mass emigration of skilled Indians in each cohort. This clarifies why the differences-in-differences analysis of Table 2 finds little relative change in the Indian human capital stock: The coup caused both a relative decrease in Indian human capital stocks via skilled emigration by older Indians (roughly, the area between the curves on the left side of Figure 3) and a simultaneous large relative rise in human capital investment by younger Indians (roughly, the area between the curves on the right side of Figure 3, minus the pre-existing gap of around three percentage points).

That is, another way to state the differences-in-differences result in Table 2 is that while the sharp rise in discrimination after 1987 caused a change in skill stocks in Fiji of -3.08 percentage points via emigration, it simultaneously caused an offsetting increase of $+3.42$ percentage points through the formation of new skills $(= 3.08 + 0.341)$. The net effect on the domestic human capital stock was positive. The remaining analysis investigates the causal mechanism for the latter, offsetting effect on new skill formation. In theory, the cause of this new skill formation could be the very depletion of existing skills by emigration.

3   Investment in taxed human capital with an exit option

An extensive theoretical literature posits that the option to emigrate could raise investment in education in a poor country, since the returns to education can be higher abroad. This effect

would tend to offset the negative direct effect of skilled emigration on the stock of skill in the home country. If the effect is large enough, and the probability of successful migration small enough, the net effect of the emigration option on the stock of education could be positive (e.g. Mountford 1997; Stark et al. 1997; Vidal 1998; Poutvaara 2008). It is difficult to directly test for this offsetting effect because in most empirical settings, a credible counterfactual is not observed.

Here we build a simple model to create an indirect test for the offsetting effect of the prospects for skilled emigration on the stock of skill in the home country. Consider a tax on skilled earnings in the home country. In the model, this tax can cause more skilled emigration without reducing the stock of skill inside the home country—two conditions that are observable. We show that the effect of the emigration prospect on skill formation is *necessary* for this result. That is, the model sets up an observable test for offsetting skill investment that cannot itself be observed.

The model first considers the effect of such a tax if the tax affects investment in education but does not affect emigration. It then considers the effect of the tax if the tax affects emigration but does not affect investment in education. It then considers the combined case where the tax can affect both emigration and investment in education.

Let the accumulation of human capital h by individual i be the combination of ability a and time spent in school acquiring education $0 \leqslant e \leqslant 1$, such that $h_i = a_i e_i$ (Zak et al. 2002; Katz and Rapoport 2005). Let a be distributed with density $g(a)$ on $[\underline{a}, \bar{a}]$. Ability and education are substitutes, so that $\frac{\mathrm{d}a}{\mathrm{d}e}\big|_h = -\frac{a}{e} < 0$. Following Brenner and Kiefer (1981), the individual lives for two periods—youth (denoted 0) and adulthood—and maximizes utility over consumption in the two periods without discounting.

Prospective investment in schooling without an exit option. The individual invests optimally and prospectively in education by solving $\max\limits_{e} U(c_0, c)$ subject to the budget constraint, expressed in terms of adult consumption, as: $c = \big((1-e)y_0 - c_0\big)r + (1-\tau)y(h)$, where y_0 is potential labor-market income in youth, $0 < \tau < 1$ is a tax on adult income $y(h)$ with $y' > 0$ and $y'' < 0$, and r is the return on saved capital. The first order condition of $\max\limits_{e} U\big\{c_0, \big((1-e)y_0 - c_0\big)r + (1-\tau)y(h)\big\}$ is the Fisher equation

$$\frac{(1-\tau)a^* y'(h^*)}{y_0} = r. \tag{1}$$

Proposition 1. *With prospective education but without exit, the tax τ reduces the stock of education by reducing the incentive to invest.*

Proof. By (1) and the implicit function theorem, $\frac{\partial e^*}{\partial \tau} = \frac{1}{1-\tau}\frac{y'}{y''} < 0$, and $\frac{\partial a^*}{\partial \tau} = \frac{1}{h^*}\frac{y'/y''}{1-\tau} > 0$. For a given level of schooling e, the fraction of the population that invests to that level is $f^*(e) \equiv \int_{a^*(e)}^{\bar{a}} g(a)\mathrm{d}a$ so by the Leibniz integral rule, $\frac{\partial f^*}{\partial \tau} = -g(a^*)\frac{\partial a^*}{\partial \tau} < 0 \forall e$. $\square$

An exit option without prospective investment in schooling: Now suppose that students *do not* invest prospectively in schooling, but instead invest at some level that is exogenous for each individual, $e_i(a_i)$ with $e' > 0$. And suppose all students can attempt to emigrate to a foreign country, with uncertain success. In the foreign country, income is untaxed and greater by a factor $\theta \geqslant 1$, but must pay cost C to migrate. The probability of successful migration is $0 \leqslant p \leqslant 1$, thus expected income is $\hat{y} \equiv p(\theta y(h) - C) + (1 - p)(1 - \tau)y(h)$. Individuals will choose to migrate if they exceed a human capital threshold where expected net income from the attempt just equals income in the home country: $\hat{y} = (1 - \tau)y(h)$, a threshold defined for a given schooling level e by

$$\hat{a} = \frac{1}{e}y^{-1}\left(\frac{C}{\theta + \tau - 1}\right). \tag{2}$$

Proposition 2. *Without prospective education, but with uncertain exit, the tax τ reduces the stock of education by raising exit among the educated.*

Proof. By (2), $\frac{\partial \hat{a}}{\partial \tau} < 0$. The average education is $E \equiv \int_{\underline{a}}^{\hat{a}} e(a)g(a)\mathrm{d}a + (1 - p)\int_{\hat{a}}^{\bar{a}} e(a)g(a)\mathrm{d}a$ among those who do not emigrate, thus $\frac{\partial E}{\partial \tau} < 0$. $\square$

With uncertain exit and prospective schooling. Suppose now that all individuals once again invest in schooling prospectively, but now they do so prospectively taking into account the uncertain overseas return on that investment. The individual solves $\max_{e} U\{c_0, ((1 - e)y_0 - c_0)r + \hat{y}(h)\}$, with the Fisher equation

$$\frac{(p\theta + (1 - p)(1 - \tau))a^{**}y'(h^{**})}{y_0} = r. \tag{3}$$

This defines optimal schooling $e^{**} > e^*$ and $a^{**} < a^*$ (comparing (1) and (3)).

Proposition 3. *With prospective schooling investment and an exit option, the tax τ has an ambiguous effect on the education stock. Unless migration cost is prohibitively high, the tax can both raise skilled emigration and raise the home-country skill stock.*

Proof. Three cases are possible: A) High migration cost, such that $a^{**} < a^* < \hat{a}(C)$: When migration cost C is sufficiently high relative to the migration gain $\theta - 1$, so that $\hat{a} > a^*$, all who emigrate would have acquired the same schooling even without the exit option. Thus $\frac{\partial \hat{a}}{\partial \tau} < 0 \rightarrow \frac{\partial E}{\partial \tau} < 0$. B) Medium migration cost, such that $a^{**} < \hat{a}(C) < a^*$: Students in the range $\hat{a}(C) < a^*$ invest in schooling with the exit option, but would not have invested without the exit option. Since $\frac{\partial \hat{a}}{\partial \tau} < 0$ and $\frac{\partial a^*}{\partial \tau} > 0$, the tax raises the fraction of the population in this range, and only a fraction $p < 1$ of those induced to acquire schooling depart the country. That is, $\frac{\partial E}{\partial \tau} = (1 - p)\frac{\partial}{\partial \tau} \int_{\hat{a}}^{a^*} g(a)da > 0$. C) Low migration cost, such that $\hat{a}(C) < a^{**} < a^*$: Since $\frac{\partial \hat{a}}{\partial \tau} < 0$, the tax raises the number of people who emigrate without investing in education, tending to raise average education among those who remain. But $\frac{\partial a^{**}}{\partial \tau} > 0$ reduces education among those who attempt emigration, tending to reduce education among those who do not successfully emigrate. The net effect on average education within the country is ambiguous. In sum, $\frac{\partial E}{\partial \tau} \gtrless 0$, depending on migration cost.[6] □

Proposition 4. *The ambiguous effect of the tax requires, as a necessary causal mediator, that the exit option alter prospective investment in education to offset emigration.*

Proof. The tax must reduce the stock of education in the absence of *either* an exit option or prospective investment in education (Propositions 1 and 2). Thus the ambiguous effect of the tax on education stock in Proposition 3 requires prospective education investment in response to the exit option. □

In sum, the tax reduces the stock of human capital in the home country either without an exit option but with prospective investment in education (Proposition 1), or with an exit option but without prospective investment in education (Proposition 2). The tax can leave human capital unchanged, or even higher, with both prospective investment in education and an exit option (Proposition 3). This implies that the exit prospect by itself causes offsetting investment in education (Proposition 4).

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[6]We omit the limiting cases $\hat{a} = a^*$ and $\hat{a} = a^{**}$, where the sign of $\frac{\partial E}{\partial \tau}$ furthermore depends on the relative magnitudes of $\frac{\partial \hat{a}}{\partial \tau}$, $\frac{\partial a^*}{\partial \tau}$, and $\frac{\partial a^{**}}{\partial \tau}$.

4   Causal mediation: non-experimental falsification tests

The evidence in Section 2 is compatible with the causal model above. But other causal mechanisms, in principle, might cause Indo-Fijians to begin massive investments in human capital after 1987 other than the mechanism of migration prospects.

In other words, it is possible that the 1987 coup caused both skilled migration and skill formation *without* skilled migration being a causal mediator for skill formation, as posited in theory in Section 3. This would require an alternative causal theory linking discrimination directly to increased human capital investment. This section presents non-experimental empirical falsification tests of several theories of this kind.

4.1   Generalized increases in education investment

One such alternative theory is that Indo-Fijians invested more in human capital generally as a purely domestic reaction to discrimination. This could occur, for example, if income effects dominated the substitution effects modeled in Proposition 1: Indians facing a negative shock to permanent income could invest more in human capital to counteract the shock, independent of an exit option.

This hypothesis is weakened by the fact that it requires large numbers of young Indo-Fijians to have made systematic mistakes about where their human capital would be utilized. In the nine years after the coup, 5,885 Fiji-trained Indian skilled workers emigrated to the three principal destination countries—almost two thirds the number of skilled Indians in all of Fiji just before the coup (Table 2). Intercensal attrition from Fiji in the decade after the coup shows that for young Indian cohorts making decisions about tertiary schooling during this period (primarily those age 8 and over in 1986, thus age 18 and over by 1996), roughly one quarter of Indians had already left the country by 1996 (Figure 4).[7] If young Indians reacting to the coup were making human capital investments considering exclusively the *domestic* return on human capital relative

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[7]Intercensal attrition in full-universe data arises from some combination of death and emigration. Close to this time period (in 1996–1998), the annual probability of death for a person in Fiji age 15–34 was only 0.16% (Carter et al. 2011, Table 1, p. 413, as $1 - (1 - (((3.6 + 2.5)/2)/100))^{(1/(34-15))} = 0.0016$. The implied ten-year rate of 0.0159 is marked in the figure, showing that nearly all the cohort attrition in Figure 4 can be attributed to emigration.

to other domestic investments, then large shares of them must have failed to rationally foresee the high likelihood that the returns on their investment would be realized abroad.

Because mass emigration began immediately after the coup (Figure 1b), claims that young Indians were systematically surprised by emigration invite skepticism. Contemporary observers within Fiji's education system reported the opposite: Indian students at the time felt "that they must become as well qualified as possible …with a long-term view to emigrating" (Tavola 1991, 53).

We can formulate more direct falsification tests by exploiting conditionality in the visas that most skilled Indians used in order to depart Fiji. Immigration systems in all the principal destination countries have heavily rewarded tertiary education as well as youth with a system of points— originating in Canada in 1967 and adopted by Australia and New Zealand coincidentally during 1987–1988. In the principal destination of Australia, the points threshold was such that, even for very young workers, qualification for an 'independent' worker visa was almost impossible without tertiary education (Masri 1990; Hitchcock 1990, 80; Angley and Barber 1988). By 1990, skill-linked visas were the chief route of entry for new settlers in Australia (Jupp 2002, 146–150). Substantial extra points were awarded, in different iterations of the system, for occupations on a 'Skilled Occupations List' including accountant, teacher, and various types of engineer, as well as occupations on a 'Migration Occupations in Demand List' including information technology professionals (Miller 1999; Crock and Lyon 2002, 37; Birrell et al. 2006).[8]

The fact that most Indian emigration was constrained by the visa points system suggests empirical tests for the prevalence of skill acquisition that is unrelated to emigration.

First, the visa points systems gave explicit credit for different levels of tertiary education, but none for secondary education. A rise in demand for education responding to that incentive should be concentrated, certainly in the short term, at the tertiary level. Conversely, if the rise reflects a generalized increase in demand for education, it should be visible at all levels of education. There was ample room for secondary schooling to rise: Just before the coup, most students in Fiji did not attain upper secondary education. Among Fijians and Indians collectively, 15 year-

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[8]The skill requirements became progressively more stringent in the two decades following the 1987 coup in Fiji. The Australian points system in selected post-coup years is presented in detail in the Appendix.

olds' attainment of *Form 4* (roughly equivalent to the 10th grade in the United States) was 45%, while 17 year-old's attainment of *Form 6* (roughly equivalent to 12th grade) was only 15%. We therefore compare the effects of the coup on enrollment at these levels to enrollment in *Form 7* (the first year of tertiary education).

The difference-in-difference effect on school enrollment was highly concentrated at the tertiary level. Figure 5 shows event-study coefficients, extending differences-in-differences analysis to more transparently reveal any differences between pre- and post-trends (Jacobson et al. 1993). The 'tertiary' line shows the difference between the Form 7 enrollment rate for 18 year-old Indians and the same rate for Fijians in each year, where the difference in 1987 is normalized to 0. This difference was stable about zero for several years before the coup, indicating equal enrollment rates in the two ethnic groups without pre-trends. After a gap in data reporting following the coup, in 1991, the Indian enrollment rate at the tertiary level was nine percentage points above the Fijian rate. Nothing close to this occurred in the enrollment rates for 17 year-olds in Form 6, or for 15 year-olds in Form 4, where the enrollment gap fell after the coup.[9]

Second, the visa points system gave explicit credit for tertiary degrees in specific disciplines, and work experience in the corresponding occupations, but not others. A generalized push for greater tertiary education should be observed across all disciplines. We used the event programs from commencement ceremonies to hand-collect the number of graduates from each of four faculties of the preeminent university in Fiji, the University of the South Pacific (USP), assigning ethnicity based on surnames that almost universally distinguish indigenous Fijians from Indo-Fijians. Figure 6 conducts an event-study analysis for the difference between the number of Indian and Fijian graduates from two sets of faculties, normalized to a base year of 1992 (the first post-coup cohort of graduates). A group of three faculties awarded degrees in majors relevant to priority occupations in Australia.[10] A fourth faculty awarded exclusively degrees conferring

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[9]By seven years after the coup, the Indian-Fijian enrollment gap began to rise past pre-coup levels, as would be expected if the secondary-school continuation decisions of families for elementary-age children at the time of the coup had been affected by the necessity of secondary school as a stepping-stone to tertiary education. The Ministry of Education did not publish its *Annual Report* containing these statistics for four years after the coup, one of various government services that were reduced or suspended. The country returned to stability during the period 1989–1991 (World Bank 1995, 5–14).

[10]The Faculty of Science and Technology provided qualifications in Computing Science and Information Technology; the Faculty of Business and Economics provided qualifications in accounting and financial management; and the Faculty of Arts and Law provided qualifications in primary/secondary school teaching. All of these occupations received maximum skill points on the when combined with postsecondary qualifications.

no skill points in the Australian immigration system.[11] The Indian-Fijian gap in both parts of the university was stable in the years leading up to the coup, but massively diverged thereafter. The difference-in-difference effect of the coup on Indian graduations from USP is concentrated in faculties awarding degrees that facilitated emigration.

These sharp contrasts between the differences-in-differences analysis of education investment that is or is not relevant to emigration—for enrollment levels and graduation disciplines—is not compatible with models yielding a generalized push for greater human capital investment by Indians unrelated to emigration. It is compatible with Proposition 4, in which the perceived relative returns to tertiary education specifically were shaped by access to the exit option via points-based visas overseas.

4.2 Regulations against alternative investments

A related but distinct alternative causal pathway could be that Indians with liquid capital—barred by discriminatory policies from investing in land or dissuaded from investing in businesses to compete with subsidized Fijian businesses—might therefore invest in education instead, likewise independent of an exit option. That is, it is theoretically possible that investment in human capital sharply increased because Indians' returns to investment in other assets declined by more than their returns to human capital investment did. This too would be expected to lead to a generalized increase in demand for education, which is incompatible with the evidence presented above in Subsection 4.1. But additional evidence is moreover incompatible with such a model.

There is no evidence of a large, sudden decline in the returns to capital investment by Indians after the coups began. There were no major expropriations of Indian-owned businesses. Between 1987 and 1997, there was no rise in the fraction of companies listed by the Fiji Registrar of Companies that were owned by ethnic Fijians; rather, this fraction slightly declined (Ratuva 2002, 232). There was no wave of Indian bankruptcies after 1987. Fijian-owned firms saw expanded access to subsidized capital through Fijian Holdings Limited and the Commercial Loans to Fijians Scheme, but the terms of credit available to Indians did not deteriorate in absolute terms. There

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[11]Students in the Faculty of Islands and Oceans acquired qualifications in tourism and hospitality, environmental science, agricultural science, land management, and related disciplines. None of these have appeared on Australia's Skilled Occupation List.

was no special tax on Indian-owned businesses, nor any lasting campaign of violence against them.

New entry of Indians into a few business sectors was regulated—notably, the government ceased issuing new taxi licenses to Indians in 1993—but this was the exception rather than the rule (Ratuva 2002). And import licenses for a limited number of products were reserved for ethnic Fijians, but this phenomenon was relatively minor. One of the most famous examples was the government's 1989 decision to reserve a portion of rice importation licenses for Fijians. But this only covered 3,000 of the 17,000 tons of rice imported that year (Sutherland 2000, 212). In short, there is little reason to suspect that Indians were investing heavily in education because they suddenly lost access to other profitable investments. A general slump in the economy in the aftermath of the coup would have lowered opportunity cost of time spent in school, but this would have been similar for both Fijians and Indians.

Nor were there major changes in Indians' returns to investment in land after the coups. 92 percent of land in Fiji was legally reserved for Fijian and public ownership, as it had been in the colonial period (Ward 1995, 199). There was little material change in this policy before 1987 or the decades after it. There were short-lived declines in land prices during the economic instability that followed the 1987 coups and the 2000 coup, but these would have affected the investment returns of Fijian landowners at least as much as Indian tenants. In the late 1990s a number of long-term leases held by Indians began to expire and some were not renewed. But as of 2000, of the 134 long-term leases that had expired, 102 had been renewed for another 30 years. And even prior to expiry, Indian tenants had no property right in the land itself and very weak property rights to improvements on it (Prasad and Kumar 2000, 131). There is thus little reason to suspect that increases in Indians' human capital investment were sparked by sharp declines in their returns to investing in land-related assets.

4.3   Remittances and capital constraints

A substantial literature discussed above has found that migrant remittances to households can cause greater schooling investment by households in a range of developing countries. Thus a different alternative to the causal mechanism in Proposition 4 is that migration caused schooling

investment by a different path: As Indian migrants accumulated abroad, they were able to send more and more money to family and friends in Fiji, alleviating local capital constraints on schooling investment. Such an effect could arise independently of an effect of emigration prospects on schooling investment.

We formulate a test of this alternative model using household expenditures on tertiary education, with and without controlling for remittance receipts. The Fiji Household Income and Expenditure Survey (HIES) conducted in 2002–2003 is the earliest post-coup nationally-representative data on family spending, with each household identified by ethnicity.[12] Table 3 shows ordinary least squares regressions with total household education spending (in current FJ$) as the dependent variable, with the sample restricted to households that are either Fijian or Indian. In the first column of Table 3, where primary education expenditures are the dependent variable, the only regressor is an indicator variable for Indian. The second column adds a range of control variables that include the amount of recent cash gifts received, such as migrant remittances. The second pair of columns repeats the exercise for secondary education expenditures, and the final pair of columns repeats it for tertiary education expenditures.

There was no tendency for Indian households at the time to spend more on primary or secondary education than Fijian households. But Indian households spent much more on tertiary education than Fijian households. The magnitude of this disparity is unaltered, in the rightmost column, by controlling for remittances received. This pattern is incompatible with higher Indian relative demand for tertiary education being driven by remittances.[13]

4.4 Side effects of education subsidies

Another alternative causal model is that the differential expansion of Indian schooling arose as an unintended side-effect of post-coup discriminatory policy. Prima facie, the Fijian-targeted education subsidies for education after the coup would tend to raise Fijian investment in educa-

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[12]A round of the HIES was conducted in 1990–1991, but concerns have been raised about its representativeness due to sampling error (Kami 1997).

[13]It is possible that some survey respondents reported remittances as 'other income' rather than 'gifts received'. For this reason we include 'other income' in the regressions that include controls. 'Other income' has a positive partial association with tertiary expenditures. But the mean fraction of household income received as 'other income' is higher among Fijian households (10.6%) than Indian households (10.5%).

tion relative to Indian investment, not the other way around. But it is possible in principle that the post-coup governments greatly expanded the supply of tertiary education available to both ethnicities, in the hope that more Fijians would take up the new spots, but found demand among Fijians to be low and fixed. In this case, tertiary attainment among Indians could rise relative to Fijian attainment even though demand among Indians did not change after mass emigration began.

There is no evidence that the Fiji government produced a large expansion in tertiary schooling supply but was unable to fill the requisite spots with Fijians. One new institution of higher education, the Fiji College of Advanced Education (FCAE), did open in 1992, coincident with the explosion of Indian tertiary attainment. But Fijians (or another, much smaller native ethnic group, Rotumans) constituted at least half of intakes to every class in the first two decades of the FCAE. Thus there was only a modest increase in supply of tertiary schooling, and Fijian demand for the new spots was not rationed.

Outside of the establishment of the FCAE, there is no evidence of a large government effort to expand the general supply of tertiary schooling at the time that Indian tertiary attainment soared. At the time that Indians poured into tertiary education in the mid-and late- 1990s, the national government's subsidies to USP and the Fiji Institute of Technology—the two leading centers of tertiary education—were flat or declining in real terms (data presented in the Appendix). Further subsidies beyond these were distributed to individuals as scholarships, but tertiary scholarships available to Indians did not increase after the coups relative to those available to Fijians; the tendency was in fact the opposite. This strongly suggests that the large majority of these students were paying their own way, and that the rise in attainment was driven primarily by demand.

4.5 Unemployment

A further alternative causal model could, in principle, arise from Indian unemployment. Given anti-Indian discrimination in, for example, hiring for public posts, it is theoretically possible that more young Indians aspiring to skilled work could have found it more difficult to obtain work. With the opportunity cost of their time reduced, they could have been more likely to enroll in tertiary education than before the rise in discrimination, for reasons unrelated to overseas

migration.

While this mechanism could have been active in some measure, we note that unemployment of educated Indians barely rose between 1986 and 1996, while unemployment of educated Fijians rose by more. In the 1986 census microdata, 2.6% of Indians with postsecondary educational attainment were unemployed (their "economic activity" was "looking for work"). In 1996, 3.0% of Indians with postsecondary attainment were unemployed ("days of work" = "unemployed"). The same figures for Fijians are 1.4 in 1986 and 3.4% in 1996. The difference-in-difference for skilled-worker unemployment (Indian v. Fijian, post- v. pre-coup) is −1.6 percentage points. This is not compatible with a large relative rise in skilled Indian unemployment. It is furthermore possible in principle that unskilled Indians suffered large declines in wages after the coup that would raise their domestic return to education, but average wages in agriculture and construction across Fiji were barely affected by the coup (data in the Appendix).

5 External validity

The external validity of these results to other developing-country settings, or other ethnic disparities in the demand for education, is unknown. That said, several facts suggest that this case is informative beyond the strictly local setting.

5.1 Other countries

Fiji was not randomly selected for this study, but was chosen for the presence of a natural quasi-experiment. It is possible that Fiji differs from other developing countries in unobserved ways. In principle, for example, Indo-Fijians might be in some sense less 'rooted' than other populations and therefore more responsive to international differentials in opportunity. Few Indo-Fijians, however, retain family ties to the Indian subcontinent, and a large number of other developing countries contain large ethnically-distinct groups with little access to land ownership. World Bank household survey data show that Indo-Fijian migrants with post-secondary qualifications remit roughly the same amounts as their indigenous Fijian counterparts (Luthria et al. 2006, Table 3.11). This suggests that even after migrating, Indo-Fijians do not exhibit markedly weak

ties to their homeland.

The external validity to other destination countries is unknown as well. We note that Australia entered recession in 1990–1991. Thus the pull from this major destination country would have been subsiding exactly when large numbers of Indo-Fijians were emigrating. In another setting with a similar large decline in home returns to human capital but no small decline in foreign returns, the impact of the home decline on investment behavior might have been larger.

5.2   Cultural predisposition

Indo-Fijians and indigenous Fijians exhibit notable cultural differences. These include religion: Indo-Fijians are predominantly Hindu, with smaller numbers of Muslims and Sikhs, while indigenous Fijians are predominantly Christian. We have noted the broad pre-coup economic similarity between the two groups (Table 1) and the various forms of differences-in-differences analysis have controlled for pre-coup differences in education investment by the two groups. It remains possible in principle that via a mechanism we do not observe, discrimination following the 1987 created purely domestic incentives for education that were objectively equal between the two groups, but Indians were more disposed to act on those incentives due to a historical predisposition toward education.

There is little evidence, however, to support this view. Education among Indo-Fijians has historically been much lower than among indigenous Fijians. In 1912, 53 percent of indigenous Fijians could read and write, while only nine percent of Indo-Fijians could (Gillion 1962, *fn* 68). For much of the early 20th century, Indians were unequivocally seen as behind the Fijians on education performance and investment (Gaunder 1999, 62; Zwart 1968). Indo-Fijians descend predominantly from illiterate *Dalit* (sometimes referred to as 'untouchable') caste migrant workers. This suggests little purely cultural predisposition toward schooling investment brought from the subcontinent. While Indo-Fijian tertiary attainment was slightly higher than Fijians' before the 1987 coup, White (2003) attributes much of the disparity not to culture but to colonial-era restrictions on internal movement by Fijians. The 1948 Fijian Affairs Regulations under the colonial government and Fijian chief Ratu Sir Lala Sukuna attempted to preserve Fijian traditions by severely restricting Fijian migration into urban areas, consequently preventing Fijian access to

jobs requiring higher schooling, and to schools geared to prepare students for those jobs.

6   Discussion

We draw two main findings. First, in the context of an exit option regulated by constrained and skill-selected migration, a rise in domestic discrimination can raise the propensity to invest in education by the discriminated ethnic group. This adds plausibility to the idea that such a mechanism contributed in some measure to high education investment exhibited by other ethnic groups that have been subjected to past discrimination under exit options—though does not constitute direct evidence that this mechanism was active in other ethnic groups. Second, the rise in education investment thus produced can be large enough to fully offset the decline in home-country stocks of skill arising from skill-selected emigration.

This occurred in a setting where many observers considered it beyond question that mass emigration by skilled workers caused net losses of educated workers. Kunabuli (1990, 189) considered the "loss" of skilled workers from Fiji "quite ominous" and compared the effects of emigration to those of a large increase in the death rate. The World Bank (1995, 23) warned that emigration imposes "huge costs" on Fiji's economy from "lost investment in human capital." (Lal 2001, 7) lamented that "the best and brightest are leaving for other shores, taking with them the skills …the country can ill-afford to lose." Walsh (2006, 57) wrote that Indo-Fijian emigration caused "crippling losses to Fiji's skilled labor force. …Fiji may have lost up to half its highly skilled labor force. …The numbers involved, and the loss of skills and experience in key occupations, can only be described as horrific." These fears appear to have underestimated young Indo-Fijians responsiveness to economic incentives. Researchers may have greatly overestimated the productivity cost of skilled emigration from Fiji when they have counted only the mechanical reduction in skill stock due to emigration, ignoring the offsetting behavioral response in human capital investment (e.g. Reddy et al. 2004).

The impacts of this quasi-experiment on various forms of human capital deserve further investigation. The model in Section 3 predicts selective emigration by people with the highest innate ability. It is therefore possible that while skilled emigration from Fiji caused a net rise in the

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stock of education during this period, it caused a decline in the stock of natural ability. Testing natural ability is difficult. Two observations, however, suggest that any such decline in natural ability among Indians is minor.

First, if the departure of Indians substantially depleted reserves of natural ability in the Indian population, and if natural ability is heritable, then we would expect to observe poorer performance on standardized tests by the children of Indians who have not emigrated. But Indian performance on standardized tests at all levels of schooling has not declined (either in absolute terms or relative to Fijians), even for children born well after mass emigration began. For example, Indian performance relative to Fijians on the standardized Fiji Junior Certificate exam—administered after 10 years of schooling—increased relative to Fijians in the two decades after Indian mass emigration began.[14]

Second, if Indian emigration is substantially decreasing the stock of natural ability in those remaining behind, and if people of lower ability tend to show lower demand for higher education, then we might expect demand for higher education among Indians to decline as the emigration proceeds. As we have discussed, the observed tendency is that Indian demand for higher education has sharply increased along with the emigration.

In sum, we find that investments into human capital can be induced in a subpopulation due to an exit option that is facilitated by human capital. In the case of Fiji analyzed here, the exit option produced an exodus of tertiary-trained Indo-Fijians—descendants of Indian immigrants of a century ago who were very similar on socio-economic observables to the indigenous population—following two coups d'état of 1987. The net, counterintuitive effect was to increase the stock of tertiary education inside Fiji. That is, the option for skilled emigration induced mass skill creation amongst the Indo-Fijians that more than offset the skill-depletion mechanically caused by emigration. We explain that investment into human capital increased for the very half of the population that suddenly faced lower prospective returns to human capital at home, and relatively higher returns abroad.

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[14]In 1986, just before mass Indian emigration began, 78.4% of Fijian children passed the standardized Fiji Junior Certificate exam while 79.5% of Indian children did so. In 2006, after two decades of heavy emigration by skilled Indians, 82.0% of Fijian children passed, while 87.3% of Indian children passed (from the 1986 and 2006 *Annual Reports* of the Fiji Ministry of Education).

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Table 1: Similarity of the ethnic groups before or shortly after the 1987 coup

	Fijians	Indians
Health and urbanization		
Fertility, 1980	3.3	3.3
Female life expectancy, 1986	65.3	65.1
Median female age at marriage, 1985	23.5	20.4
Infant mortality, 1986	19.2	21.0
Percent of population urban, 1986	32.7	41.4
Employment and income		
Unemployment, 1986	4.3%	4.0%
Percent in poverty, 1989	31.3	34.5
Avg. weekly earnings, 1986	FJ$136.9	FJ$144.7
Household weekly income/cap., bottom quintile 1989	FJ$10.9	FJ$10.4
Household weekly income/cap., top quintile 1989	FJ$95.6	FJ$151.2

Fertility, age at marriage, life expectancy, urban population, infant mortality, and earnings data from Bureau of Statistics (1990, 5, 7, 11, 13, 14, 73). Poverty figures based on household income from (UNDP 1998, 32, Table 14), where poverty is defined as a household income less than 50% of the national average. Household income per capita figures by quintile is in weekly current Fiji dollars and is based on (UNDP 1998, 25, Table 10). Unemployment data and corroboration of other statistics in this table from Bureau of Statistics (1990, passim).

Figure 1: The differential effect of post-1987 discrimination on emigration by skilled Indians

(a) Population of Fiji   (b) Permanent emigration from Fiji   (c) Fiji Islander settlers in Australia
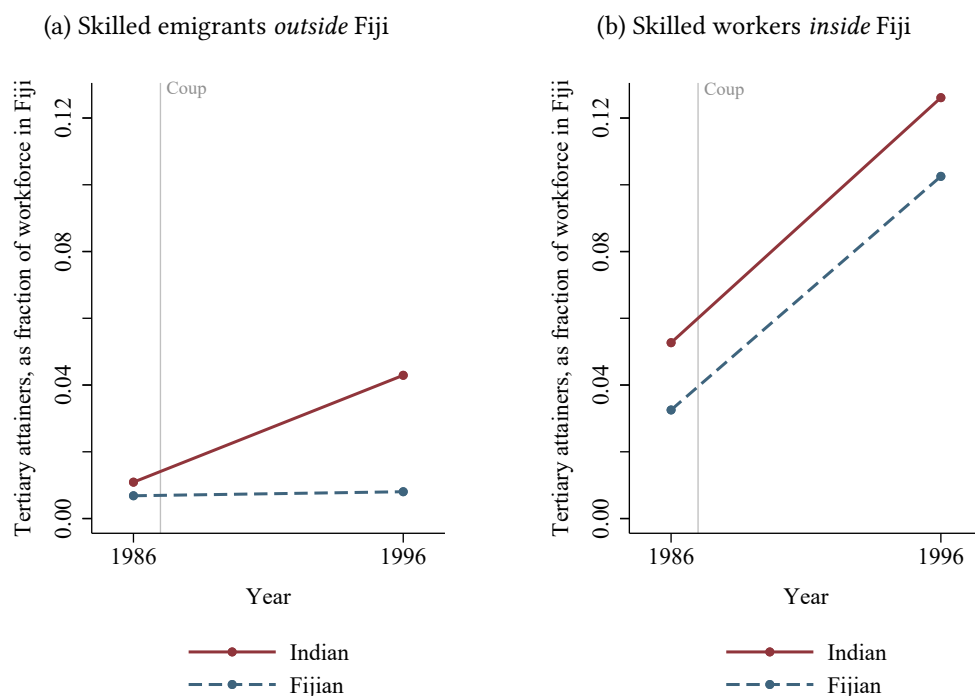

Sources for Fiji data in (a) and (b) in the Appendix; source for Australian data in (c) is Australian Bureau of Statistics. The white area in (c) shows years for which the breakdown into skilled and other visas was not available.

Table 2: Differences-in-differences for tertiary education stocks outside Fiji and inside Fiji: Indian v. Fijian, post- v. pre-coup

	Pop., total		Tertiary educ.		Frac. of workforce in Fiji Tertiary educ.		Time
Ethnicity	1986	1996	1986	1996	1986	1996	diff.
OVERSEAS: FIJI-TRAINED EMIGRANTS							
Australia							
Fijian	1,461	3,447	234	397			
Indian	2,020	16,100	470	2,873			
New Zealand							
Fijian	2,775	4,671	315	615			
Indian	2,610	15,453	345	2,367			
Canada							
Fijian	4,330	3,645	510	530			
Indian	6,350	13,315	1,080	2,540			
Total overseas							
Fijian	8,566	11,763	1,059	1,542	0.00683	0.00803	0.00120
Indian	10,980	44,868	1,895	7,780	0.0109	0.0429	0.0320
					Diff-in-diff (Indian, post):		+0.0308
AT HOME: NON-EMIGRANTS							
Fiji							
Fijian	329,306	393,575	5,043	19,683	0.0325	0.103	0.0700
Indian	348,704	338,818	9,160	22,859	0.0527	0.126	0.0734
					Diff-in-diff (Indian, post):		+0.00341
	Workforce						
Fijian	*155,015*	*191,965*					
Indian	*173,842*	*181,270*					

All data extracted from full-universe census masterfiles in the four countries. 'Tertiary educ.' means a person with tertiary education attainment. 'Fiji-trained' means emigrated at age 20 or after. 'Workforce' is the size of the population age 20–65.

Figure 2: The effect of post-1987 discrimination on skilled emigration and domestic skill stocks

(a) Skilled emigrants *outside* Fiji

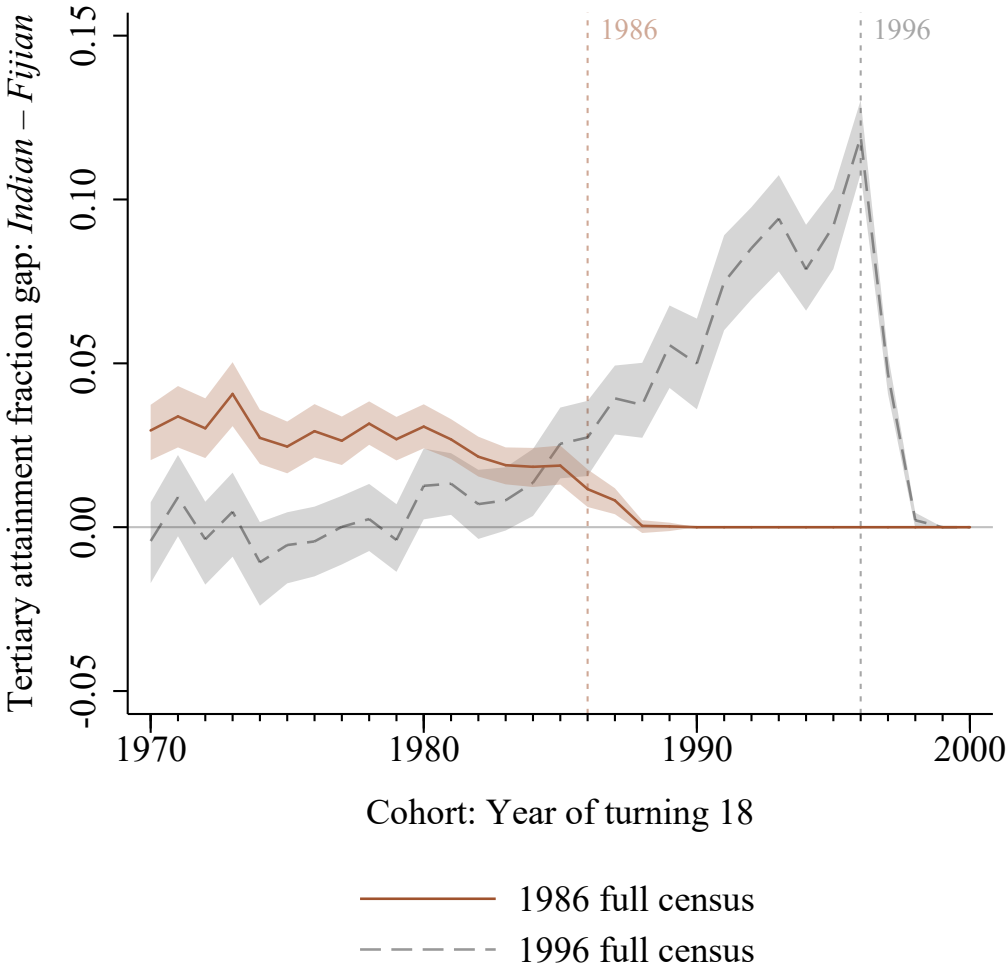(b) Skilled workers *inside* Fiji

'Outside Fiji' comprises Fiji-born in census of Australia, New Zealand, or Canada. The denominator in both figures is the number of people of each ethnicity age 20–65 in the Fiji census in each year. Skilled emigrants include only those who arrived in the destination country at age 20 or above. 'Skilled worker' means a worker with tertiary education attainment.

Table 3: Schooling expenditures by ethnic group in Fiji, 2002–2003

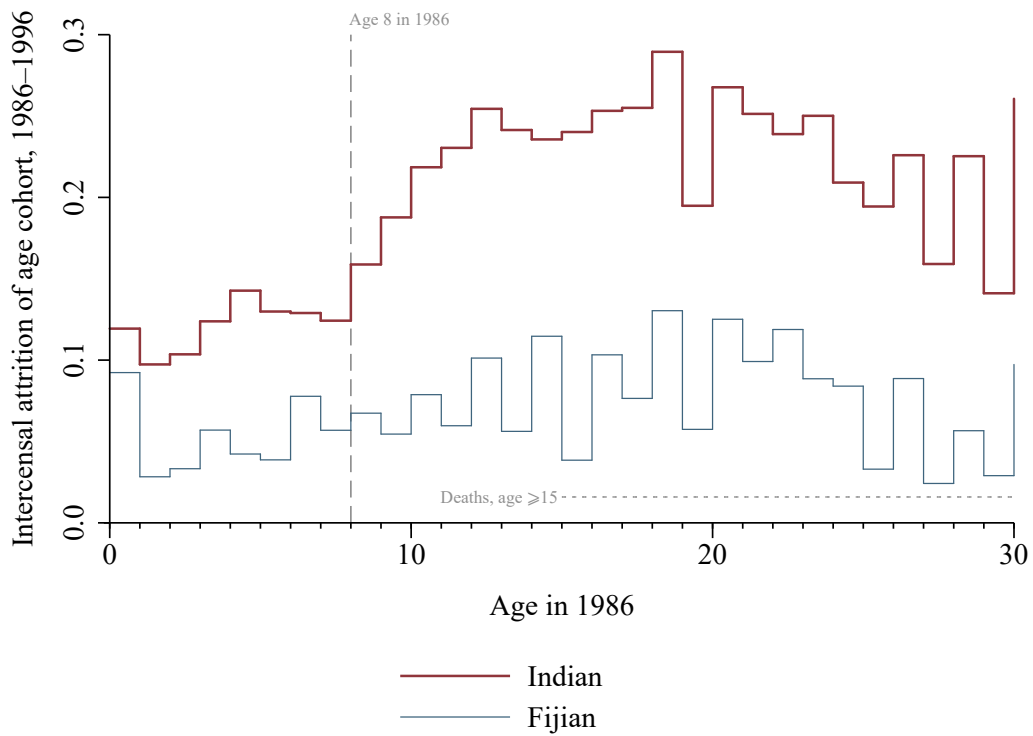| *Dep. var.:*	Expenditure on schooling					
	Primary		*Secondary*		*Tertiary*	
Indian	−28.8	−13.0	−21.1	−6.0	124.2	129.1
	(4.4)	(5.1)	(8.5)	(8.1)	(26.5)	(24.8)
Controls?	No	Yes	No	Yes	No	Yes
N	4,977	4,977	4,977	4,977	4,977	4,977
Adj. R^2	0.008	0.084	0.001	0.046	0.004	0.044

Data from the nationally-representative Fiji Household Income and Expenditure Survey 2002–2003. Ordinary least-squares regressions on nationally-representative household-level sample that includes all households identified as either 'Fijian' or 'Indian', with 'Fijian' as the base group; other ethnicities (4.4% of the population represented) are omitted. Regressions weighted by sampling weight, robust standard errors in parentheses. 'Controls' are: Total household income and total household income squared (in FJ$), income as 'gifts received' or as 'other income' (in FJ$), number of household members, number of household members age 15–34, number of household members female, indicator of head-of-household female. All regressions include a constant term.

Figure 3: Test for pre-trends: The Indian-Fijian gap in tertiary attainment fraction by age cohort in full-universe Fiji census data, observed in 1986 and 1996

Figure 3: Test for pre-trends: The Indian-Fijian gap in tertiary attainment fraction by age cohort in full-universe Fiji census data, observed in 1986 and 1996
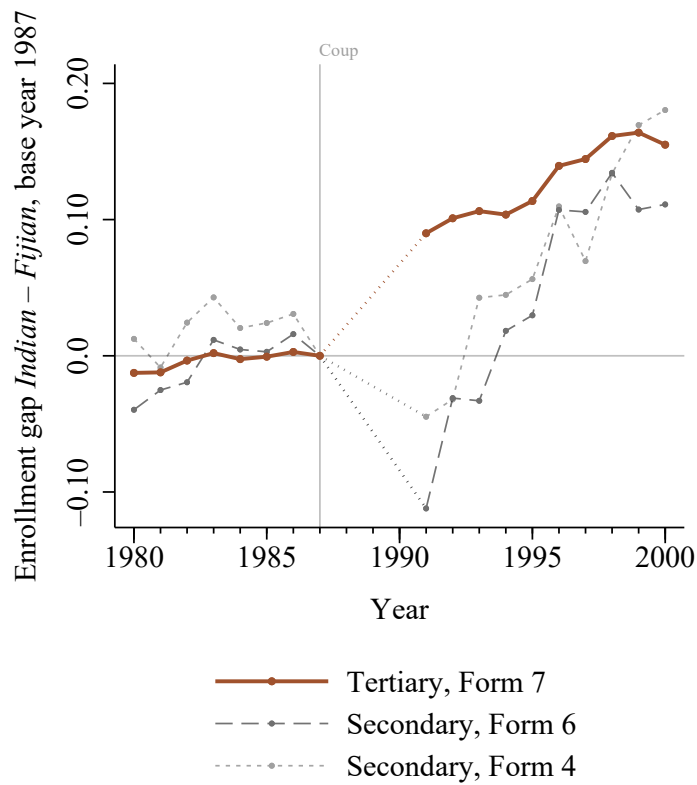

Randomization-inference standard errors (Abadie et al. 2017) are the basis for the 95% confidence interval in each shaded area, calculated as percentiles 2.5 and 97.5 of the distribution of the estimated Indian-Fijian gap in tertiary attainment fraction when true ethnicity is replaced with randomly-assigned Indian or Fijian identity, across 500 draws within each census year-cohort year cell. Random draws of ethnicity for each individual are constrained to preserve the true Indian fraction of the overall population in each census year. Horizontal axis shows the year in which each person did or would reach age 18: for example, the '1980' cohort for the 1986 census contains people age 24 at the time they were observed in 1986, and the same cohort for the 1996 census contains people age 34 at the time they were observed in 1996.

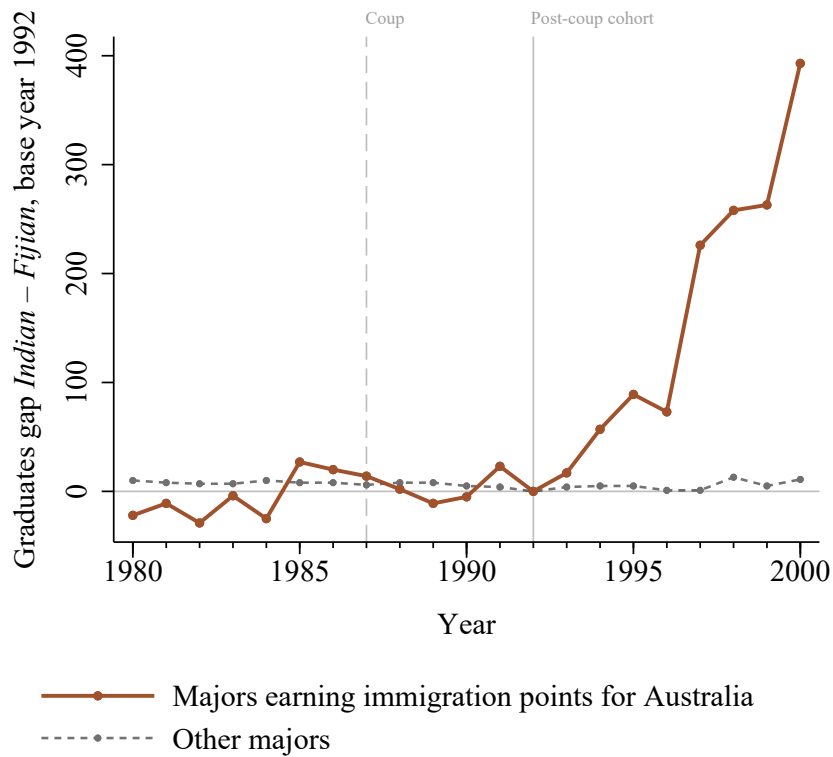**Figure 4**: Intercensal attrition from Fiji, by age cohort and ethnicity

From full-universe Fiji census data masterfiles, 1986 and 1996. Other ethnicities omitted. Graph shows the fractional decline in the size of each age-ethnicity cohort between the censuses. Almost all intercensal attrition in full-universe data arises from some combination of death and emigration. Close to this time period (in 1996–1998), the annual probability of death for a person in Fiji age 15–34 was only 0.16% (Carter et al. 2011, Table 1, p. 413, as $1-(1-(((3.6+2.5)/2)/100))^{(1/(34-15))} = 0.0016$. This is marked on the graph as the corresponding ten-year death probability of 0.0159.

Figure 5: Event study coefficients: School enrollment in Fiji

Enrollment figures from Ministry of Education *Annual Report*, various years; denominator is the size of age cohorts by ethnicity as calculated by the Fiji Islands Bureau of Statistics. See Appendix for details. *Form 4* corresponds roughly to 10th grade in the United States and the modal enrollee is age 15. *Form 6* corresponds roughly to 12th grade in the United States and the modal enrollee is age 17. *Form 7* is the beginning of tertiary education and the modal enrollee is age 18.

Figure 6: Event study coefficients: Graduates' majors at the University of the South Pacific in Fiji

Source: USP commencement programs for the years in question. Ethnic groups assigned by student name. 'Majors earning immigration points for Australia' comprises graduates of the Faculty of Science and Technology (whose majors included Computing Science and Information Technology), the Faculty of Business and Economics (whose majors included accounting and financial management), and the Faculty of Arts and Law (whose majors included primary/secondary school teaching). All of these occupations received maximum skill points on the when combined with postsecondary qualifications. 'Other majors' comprises students graduating from the Faculty of Islands and Oceans (whose majors included tourism and hospitality, environmental science, agricultural science, land management, and related disciplines). None of these have appeared on Australia's Skilled Occupation List.

Online Appendix
"Human capital investment under exit options: Evidence from a natural quasi-experiment"

A1 Data sources

Full-universe census data: For Fiji, full universe microdata from the Census of Fiji 1986 & 1996, and the Household Income and Expenditure Survey 2002–2003, were graciously provided by Toga Raikoti and Epeli Waqavonovono of the Fiji Islands Bureau of Statistics. For Australia, tabulations of Fiji-born from the full-universe census masterfiles of 1986 and 1996 were custom-prepared by Barbara Dehne at the Australian Bureau of Statistics: 'Fijian' defined as 'ancestry' is Fijian and 'religion' is 'Christian'; 'Indian' defined as 'ancestry' is 'Indian, Sinhalese, Sikh, Pakastani, Tamil or Bengali' and 'religion' is 'Hindu, Muslim, or Sikh'. For New Zealand, tabulations of Fiji-born from the full-universe census masterfiles of 1986 and 1996 were custom-prepare by David Tresch of Statistics New Zealand (extract LYM25970): 'Fijian' defined as 'ethnic group' Fijian or Rotuman; 'Indian' defined as 'ethnic group' Indian. For Canada, tabulations of Fiji-born from the full-universe census masterfiles of 1986 and 1996 were custom-prepared by Marcel Boudreau of Statistics Canada (extract BO-0405): 'Fijian' defined as 'ethnic origin' is 'Fijian', 'Pacific Islander', or 'Polynesian'; 'Indian' defined as 'ethnic origin' is either 'Fijian and South Asian origins' or 'Other South Asian origins'.

Annual enrollment by grade level and age: In each case the numerator is the number of children of each ethnicity enrolled in the given grade level who have the given age or lower. These numbers are taken from the *Annual Report* of the Ministry of Education, in each year. During post-coup reductions in government services, the Ministry of Education did not produce an annual report covering the years 1988, 1989, and 1990. The denominator is the number of people of each ethnicity who have the given age, in each year. The raw data for these estimates come from the age pyramids in the reports on the census of the population (1966, 1976, 1986, and 1996), plus an additional timepoint from the intercensal population pyramid estimates for 2003 published by the Fiji Bureau of Statistics (Fiji Islands Bureau of Statistics, *Key Statistics*, June 2008, "Population: Table 2.5, Estimated Population by Ethnic Origin, Sex and Age as at 31st December 2003", https://lccn.loc.gov/2002260134). Populations at each age level for the intervening years are interpolated geometrically.

Graduates from the University of the South Pacific: Number of graduates from USP by program of study and ethnicity: compiled using name-list for graduating students for each year in commencement ceremony programs held by the library of the University of the South Pacific. Ethnicity assigned by student names. We estimate that fewer than two percent of students have names that leave ambiguity about their ethnic group.

Public subsidies to the University of the South Pacific and the Fiji Institute of Technology: These are taken from the following Fiji government publications: *Fiji Budget Estimates 1993, as approved by Parliament*, page 150; *Fiji Budget Estimates 1995, as approved by Parliament*, page 148; Ministry of Education, Women, Culture, Science and Technology, *Annual Report for the Year 1995* (Suva: Parliament of Fiji), p. 2; Ministry of Education, Women, and Culture, *Annual Report for the Year 1996* (Suva: Parliament of Fiji), p. 4; Ministry of Education and Technology, *Annual Report for the Year 1997* (Suva: Parliament of Fiji), p. 4; Ministry of Education and Technology, *Annual Report for the Year 1998* (Suva: Parliament of Fiji), p. 6; Ministry of Education, *Annual Report for the Year 1999* (Suva: Parliament of Fiji), p. 6; Ministry of Education, *Annual Report for the Year 2000* (Suva: Parliament of Fiji), p. 6; Ministry of Education, *Annual Report for the Year 2001* (Suva: Parliament of Fiji), p. 8; Ministry of Education, *Annual Report for the Year 2003* (Suva: Parliament of Fiji), p. 9; Ministry of Education, *Annual Report for the Year 2004* (Suva: Parliament of Fiji), p. 8. They are deflated to 2004 real Fiji dollars using the Consumer Price Index in Fiji Islands Bureau of

Statistics, *Key Statistics*, December 2007, p. 75 ("All Items").

Departures from and arrivals in Fiji, by ethnic group: 1970–87: Bureau of Statistics (1990), *Social Indicators for Fiji*, Issue No. 5, Table 1.7. 1989–93: Bureau of Statistics (1994), *Current Economic Statistics*, July 1994, Table 12.2, p. 87. 1985–99: Fiji Islands Bureau of Statistics (2000), *Key Statistics*, September (Suva), Table 12.2, p. 92. 2000–03: Fiji Islands Bureau of Statistics (2007), *Key Statistics*, March (Suva), Table 12.2, p. 86. 1962–69: Bureau of Statistics (1976), *Social Indicators for Fiji*, Issue No. 3 (Suva), Table 1.7, p. 72. 1988: Bureau of Statistics (1989), *Fiji Tourism and Migration Statistics 1988*, pp 54, 56. 1994: Bureau of Statistics (1989), *Fiji Tourism and Migration Statistics 1993-1994*, pp 64, 68. Corroborated by: Bureau of Statistics (1995), *Tourism and Migration Statistics 1993-1994* (Suva), Table 31.2, p. 68.

Settler visas issued to Fiji-born by Australia: Provided by Neil Mullenger and David Osborne of the Australia Department of Immigration and Citizenship.

Long-run Fiji census data: 1881–1996: Fiji Islands Bureau of Statistics (2007), *Key Statistics: March 2007* (Suva), Table 2.1, page 3. 2007: http://www.statsfiji.gov.fj, main page, accessed Oct. 28, 2007.

A2   The Australian Points System over time

Table A1 outlines the system of points determining Fiji Islanders' access to general skilled independent settler visas during selected post-coup years.
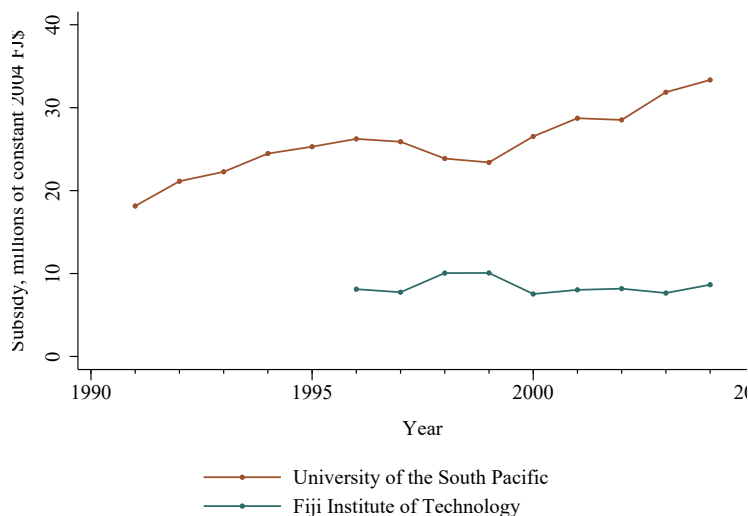
A3   Supplementary data referenced in main text

Figure A1 presents data on real Fiji national government subsidies to the two leading institutions of postsecondary education. Figure A2 presents Fiji government estimates of average real low-skill wages in Fiji.

Appendix Table A1: The Australian points system for a general skilled independent settler visa, various years after 1987

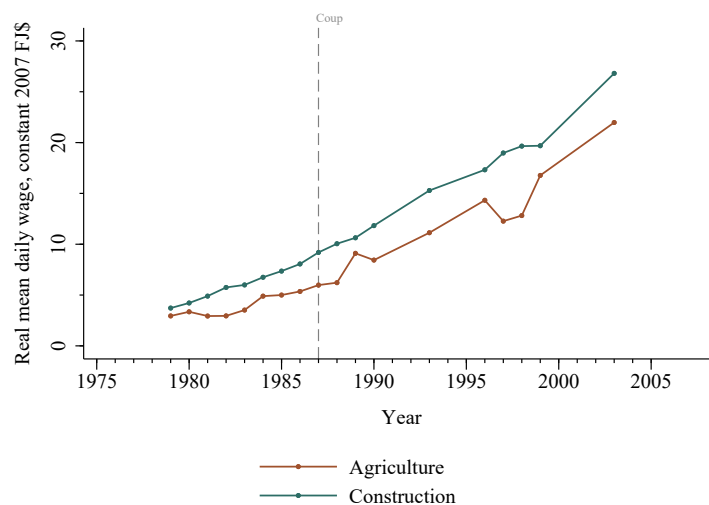| Year:	1988	1989	1992	1995	2002	2004	2008
Pass mark:	**80**	**95**	**110**	**110**	**115**	**120**	**120**
Age:							
18−19	10	30	30	30	30	30	30
20−24	15	30	30	30	30	30	30
25−29	15	20	20	30	30	30	30
30−34	15	15	15	25	25	25	25
35−39	10	10	10	15	20	20	20
40−44	10	5	5	10	15	15	15
45−49	0	5	5	0	0	0	0
Skill: Tertiary education, Bachelor's degree or higher							
Priority occupation, >3 years exp.	65	80	80	80	70	70	70
Priority occupation, <3 years exp.	65	60	60	60	60	60	60
Not priority occupation, >3 years exp.	60	70	70	70	60	60	60
Not priority occupation, <3 years exp.	55	60	60	60	50	50	50
Skill: Tertiary education, Associate degree or diploma							
Priority occupation, >3 years exp.	65	55	55	55	50	50	50
Priority occupation, <3 years exp.	65	50	50	50	40	40	40
Not priority occupation, >3 years exp.	60	55	55	55	0	0	0
Not priority occupation, <3 years exp.	55	50	50	50	0	0	0
Language							
Highest English proficiency	0	20	20	20	20	20	20
Fluent in 'community language'	0	0	0	0	5	5	5

'Experience' ('exp.') in this table refers to experience in the area of qualification under which the person applies. 'Community languages' included Fijian and Hindi. Sources: **1988:** John Angley and Stephen Barber (1988), "Australia's Immigration Program: Some Aspects", Legislative Research Service Current Issues Paper 2 (Canberra: Parliament of the Commonwealth of Australia). **1989 and 1992:** Hitchcock, Neil E. (1992), *Immigration to Australia: An Authoritative Guide to Seeking Migrant and Other Visas to Australia* (Sydney: Neil E. Hitchcock & Associates), page 83. **1995:** Federal Register of Legislation (Australia), Dec. 1, 1995, *Specification of Pass Mark in Relation to Applications for Independent (Migrant) (Class AT) Visas.* **2002:** Stephen Yale-Loehr and Christoph Hoashi-Erhardt (2002), "A comparative look at immigration and human capital assessment", in Mary Crock and Kerry Lyon, eds., *Nation Skilling: Migration, Labor, and the Law* (Sydney: Asia Pacific Migration Research Network). **2004:** Robert Birrell, Lesleyanne Hawthorne, and Sue Richardson. *Evaluation of the general skilled migration categories* (Canberra, Australia: Department of Immigration and Multicultural Affairs), 2006, page 33. **2008:** Australian Dept. of Home Affairs, http://www.immi.gov.au/skilled/general-skilled-migration/175/eligibility-applicant.htm, accessed May 7, 2010.

Figure A1: Fiji government real transfers to the University of the South Pacific (USP) and the Fiji Institute of Technology (FIT), 1991–2004

1991–1993 data from *Fiji Budget Estimates, As Approved by Parliament*, 1993 (p. 150) and 1995 (p. 148). 1994–2004 data from Ministry of Education *Annual Reports*: 1995 page 2; 1996 page 4; 1997 page 4; 1998 page 6; 1999 page 6; 2000 page 6; 2001 page 8; 2002 page 8; 2003 page 9; 2004 page 8. The Ministry of Education did not publish its *Annual Report* in the four years after the 1987 coup. Converted to constant 2004 FJ$ using Consumer Price Index from Fiji Bureau of Statistics, *Key Statistics*, December 2007, Table 9.1, p. 75.

Figure A2: Fiji average real wage for low-skill work, 1979–2003

Breaks in the time series correspond to omissions in the source materials. Source: Nominal wages from Fiji Islands Bureau of Statistics, *Key Statistics*, Dec. 2007, pages 75 and 82. Deflated to constant 2007 FJ$ with Consumer Price Index from *Key Statistics*, various years.