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The Intergenerational Transmission of Jobs, Employment and Earnings*

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Abstract

We use a large administrative data base on a cohort of young Canadian men to document and explain the degree to which their adult earnings are related to the earnings of their fathers. Our theoretical analysis of intergenerational earnings mobility modifies the often-used Becker and Tomes model to recognize that parents may influence the job search decisions of their children, passing on labour market information and in the extreme finding jobs with employers for which they have also worked. We draw testable implications from this theory in the context of both perfect and imperfect capital markets, and examine them empirically. We find that about 40% of these men have at some point been employed with an employer for which their father also worked, and using appropriate maximum likelihood methods show that intergenerational transmission of employers reduces the degree of generational mobility. We also show that this offers an explanation for non-linearities in the father-son earnings relationship observed but not explained by the existing literature.

JEL Classifications:

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The Intergenerational Transmission of Jobs, Employment and Earnings

An established sociology literature addresses the intergenerational transmission of occupations and socio-economic status. In this literature intergenerational mobility is oftentimes related to the notion of class, but as a reading of many of the essays in Morgan, Gursky, and Fields (2006) suggests this is an elusive concept though it is used to refer in some sense to distinct boundaries in or barriers to mobility, both upward and downward. In effect there are discontinuities in the degree of generational mobility with individuals not moving between classes. This idea continues to have resonance because it speaks directly to the notion of equality of opportunity, a defining metaphor for many market based economies.

But there is also a growing literature in economics also speaking to equality of opportunity. The focus in this literature is on the intergenerational transmission of earnings, with the analysis generally being framed in the context of a linear regression to the mean model. This is motivated theoretically by models of parental investments in the human capital of their children as in the utility maximization models of Becker and Tomes (1986, 1979). However, the major thrust of the empirical research in this area is on the econometric challenge of correctly estimating the elasticity of earnings between parents and their children. Solon (1992, 1989) and Zimmerman (1992) offer a starting point that has led to a large number of studies from a number of countries. They develop and extend concerns about measurement error and life cycle bias in earnings discussed in Atkinson, Maynard and Trinder (1983) and Jenkins (1987). Björklund and Jäntti (2008),

Corak (2006), and Solon (2002, 1999) survey some of this literature, with Böhlmark and Lindquist (2006), Grawe (2006), and Haider and Solon (2006) offering the most recent methodological developments. This literature is distinct from that in sociology in assuming linearity and continuity of the parent-child earnings relationship, the empirical findings highlighting the average degree of mobility in society as a whole.

Yet some of the empirical findings suggest that these assumptions are not entirely appropriate. The attention given to measurement error, and the resulting understanding of how to deal with it, now opens a window for this literature to develop by examining model specification, and more directly relating empirical findings to underlying causal processes. In fact, Becker and Tomes (1986) offer a theoretical rationale for non-linearities in the degree of intergenerational earnings mobility across the parental earnings distribution. And nonlinearities have been uncovered for some countries with data of appropriate size and quality, though not necessarily corresponding to the theoretically predicted patterns (Bratsberg *et al* 2006, Corak and Heisz 1999, Grawe 2004, Hertz 2004, Hyson 2003).

While both literatures, the sociological and the economic, are highly descriptive they have also led to a greater appreciation of causal processes: the former focusing on social capital and the access to and role of formal education; the latter on monetary investments related to educational attainment. But attention to sibling and neighbourhood effects, as in for example Bjorklund *et al* (2002), Bjorklund, Lindahl, Plug (2006), Oreopolous (2003), and the research summarized in Solon (1999), suggests that within family, as opposed to peer or neighbourhood, influences play the central role in determining the degree to which a child's life chances are tied to socio-economic

background. As such both literatures have links to the growing research on early childhood development, the formation of values and preferences, and their impact on readiness to learn and pro-social behavior that are important antecedents to educational attainment and ultimately labour market success.

There seems, however, to be less emphasis on the original—at least as expressed in sociology—concerns with the structure of labour markets, the constraints or barriers embedded in them, and access to particular occupations or jobs. Studies of the demand side of the labour market describe persistent differences in wages across firms and industries, as for example in Abowd, Kramarz, Margolis (1999) who examine wage differences between small and large firms or in Krueger and Summers (1988) who discuss inter-industry wage differences. The latter suggest that it is difficult to attribute persistent inter-industry wage differences in the United States to worker-specific traits, but using firm level data for France Abowd, Kramarz and Margolis find that while firm specific effects are not unimportant, the distribution of workers explains a large part of inter-industry and firm-size wage differences. In general, these studies and an associated literature documenting within industry firm differences, as for example in Baldwin (1998), suggest that more productive and more highly-paid workers are concentrated in particular firms.

While these patterns exist on the demand side it is also well-known that on the supply side families and friends plays an important role in the job search process. Granovetter (1995) is an often cited source documenting this in a small scale survey for a particular labour market, but the patterns are well established in nationally representative surveys with Loury (2006) suggesting that up to 50% of jobs are found through family,

friends or acquaintances. Ionnides and Loury (2004) offer a detailed survey and document the extent of this sort of networking, and Grenon (1999) reports that for Canada about one-quarter of successful job searches involve family or friends. Though the impact of using family and friends to find a job on the wages that are subsequently earned is sometimes found to be positive and sometimes negative, Loury also shows that the highest wages are paid to those who find jobs through "prior generation male" relatives who actually knew the potential employer or served as a reference. In this US study roughly 10% of men found jobs in this way. Kramarz and Skans (2007) are even more specific concerning the nature of the contacts, pointing out that there is a high tendency for young adults in Sweden to find their first job in the same plant that employs their parent.

If the demand side of the market is structured into high and low paying firms and if close family relatives play an important role in finding jobs, then is it possible that the degree of intergenerational mobility has something to do with not only human capital investment when children are young, but also with the outcome of the job search process when they are older? This is the question that motivates our research, and we explore it by relating the most basic insights from job search theory to the intergenerational transmission of employers and hence earnings. As such our analysis of intergenerational mobility focuses on the role that parents play not just in the educational attainment of their children, attainment that leads to qualifications for particular occupations, but also the role they play in structuring the child's interface with the labour market, informing and perhaps even directing the search for jobs that the child is qualified to accept, and in the extreme influencing the degree to which employers are passed on across the

generations. In this way we suggest that the intergenerational mobility literature should not lose sight of the role played by the structure of labour markets. This also speaks to the public policy concerns associated with equal opportunity. It suggests that the underlying causal processes are associated not just with schooling, but also with the information and contacts leading to employment in particular industries and firms. We show that the intergenerational transmission of employers plays a role in explaining the intergenerational transmission of earnings, and in particular non-linear patterns involving a high degree of earnings immobility at the top of the parental earnings distribution—at least as uncovered by Corak and Heisz (1999)—and for which the literature has yet to offer an explanation.

In the first part of the paper we show that this sort of non-linearity is in fact the prediction of theory when a very simple job search model is wedded to the Becker-Tomes model of intergenerational mobility. We draw a number of insights from this formulation in the context of both perfect and imperfect capital markets, among them that parent and child earnings will be causally linked through the intergenerational transmission of employers even in the context of perfect capital markets. The two subsequent sections of the paper offer results from an empirical investigation of intergenerational earnings mobility using a large administrative data source on a cohort of Canadian men. These data contain information for both fathers and sons on up to four employers per year starting in the year the child was 15 years old and continuing to the age of 33. They allow us to document and model the intergenerational transmission of employers, and then to use this in an appropriately specified empirical model of intergenerational earnings mobility.

2. Theoretical framework

The general structure of models dealing with the intergenerational transmission of inequality involves a two period horizon in which parents use their income both for consumption and for invest in their children during the first period, while children work and consume as adults in the second period. Then the world ends. This is a fruitful simplification of a world in continuous time with overlapping generations, as illustrated for example in Mulligan (1997, pp.14-15). Parents care both about own consumption in the first period and about some measure of their child's welfare—income or utility—in the second period. Their maximization problem involves allocating their endowment between current consumption and expenditures that will increase the earnings capacity, and hence future well-being, of their children. The earnings generating function for the child in adulthood as presented in Becker and Tomes (1986) is:

$$Y_t = \gamma_t H_t(x_{t-1}, s_{t-1}, E_t) + l_t \qquad (1)$$

The earnings of an individual of generation t are represented as Y_t , and reflect the human capital of the individual H_t , its valuation in the labour market γ_t , and market luck l_t . Human capital is assumed to be homogenous, and the total amount accumulated is proportional to the amount accumulated during childhood, reflecting the private expenditures of parents, x_{t-1} , public expenditures, s_{t-1} , and the child's endowment, E_t. All of these arguments have positive marginal products. The latter, E_t , is thought of as ability, reflecting in most of this literature the cultural or genetic attributes of the family that are passed on to the child in a way not determined by parental control, and hence not responsive to incentives. This is what distinguishes it from human capital.

Though Becker and Tomes (1979) put forward a model in which parents can invest in the endowments of their children this is generally not the case, and endowments are assumed to be transmitted mechanically across generations according to a Markov process as given by, to once again use the notation of Becker and Tomes (1986), equation (2).

$$E_t = \alpha_t + hE_{t-1} + v_t \tag{2}$$

Ability complements human capital, raising the marginal returns of parental or public expenditures, so that $\delta^2 H_t / \delta x_{t-1} \delta E_t > 0$ and $\delta^2 H_t / \delta s_{t-1} \delta E_t > 0$, and implying that the optimal amount of human capital investment in a child will depend upon his or her endowment. The returns to human capital investment are higher for more able children. Parents observe the endowments of their children, and make investments that are subject to a diminishing marginal return. All parents are able to make the optimal human capital investment notwithstanding their income or the ability level of their children if capital markets are assumed to be perfect. This assumption permits even low income parents of high ability children to make the optimal level of investment. In this way the human capital and hence earnings outcomes of children are separated from parental income, and the intergenerational transmission of inequality is determined by the degree to which ability is transmitted across the generations, as given by h.[1] The fact that earnings regress to the mean according to the inheritability of endowments, and independently of parental earnings, is a key result in this strand of the literature

Working life-times are collapsed into a single period for convenience. It is as if at the onset of the second period γ_t —reflecting the technology of the period as well as the

[1] As Mulligan (1997) makes clear this also assumes that parental preferences are homothetic and therefore that the degree and nature of intergenerational altruism implies linear expansion paths.

demand and supply conditions in the labour market for different levels of human capital—becomes known, l_t is drawn from a stationary stochastic distribution, and then together they determine how the human capital of the adult child is translated into earnings for the entire period. Clearly this is a simplification. As Becker and Tomes (1986, p. 243) note it is the total amount of human capital that determines earnings, including on-the-job training. So the process of human capital accumulation certainly continues during the course of the second period, but this is assumed to be directly proportional to the amount accumulated during childhood. In this way it is appropriate to not distinguish life cycle dynamics any finer than the two phases of childhood and adulthood.

We re-examine this model by recognizing that the nature of uncertainty facing the child in adulthood may be more complex than a single random draw from a stable distribution reflecting market luck. In the first instance our focus is on the realization of l_t in equation (1). We suggest that there is also a process with respect to the realization of l_t that plays out at the beginning of the second period, and is subject to the maximizing behaviour of the child. However, this need not—though it may—be related to the investment behaviour of parents during the first period, and as such needs to be modeled in its own right. We use the basic results from job search theory to do this, and in particular analyze the influence that the job market contacts of the parent during the first period, most notably information about the firm at which the parent is employed, have on the earnings outcome of the child.

In order to do this it is helpful to follow Mulligan (1999, 1997 pp. 55-7) in recognizing that endowments may have two dimensions: one that shifts the earnings

function in a way that alters marginal returns and determines the efficient level of human capital; another that shifts it in an additive way and does not alter its slope. We posit that the job market contacts of the parent have both of these characteristics.

Our approach, then, is to: (1) loosen slightly the restriction that the entire adult life cycle of the child can be collapsed to a single period; (2) characterize parental job contacts as a type of endowment that is transmitted to the child; and (3) use basic results from job search theory to re-interpret the model and reveal more detail about the realization of l_t and its influence on the child's adult earnings. This opens up a channel in the context of a perfect capital markets assumption for parental income to play a role in determining child outcomes. We then reframe this discussion for the case of imperfect capital markets in a way that lets parental contacts influence the optimal human capital investments of children by relaxing the credit constraints parents may face.

a. Perfect capital markets

In the context of perfect capital markets we are concerned only with equation (1), given that parents have made the optimal level of investment in the human capital of their children during the first period. At the same time we assume that parents influence the endowments of children through a channel other than that expressed in equation (2), in a way that is related to their earnings in period 1. We characterize this influence as shifting the earnings generating function without changing its slope, and therefore, given that the cost of funds is constant, the optimal level of human capital investment.

This type of endowment influences the child's reservation wage, and hence the realization of l_t . For two individuals of equal ability as measured in equation (2), the

individual with the higher reservation wage will have higher earnings. Lancaster and Chesher (1983) give a succinct exposition of the standard job search model, including a series of analytically useful results upon which we draw. This, of course, is a very simple characterization of an immense literature recognizing a host of complexities in the job search process, as surveyed for example, by among others, Devine and Kiefer (1991). Nonetheless it suffices to generate relevant insights for the analysis of intergenerational mobility.

The individual seeks to maximize the expected present value of an income stream, usually over an infinite horizon; a problem that involves the decision to accept or reject wage offers, say W, per unit time given that the individual receives with certainty a constant non-wage income when not employed. The latter is usually thought of as an unemployment benefit, say Z. Job offers are random variables drawn without replacement from a constant distribution with mean μ and distribution function $F(W)$. They arrive at a constant rate ω per unit time, and future incomes are discounted at rate ρ. This formulation is well known as are the solutions to the maximization problem: over an infinite horizon the individual's optimal decisions are characterized by a reservation wage, W^R, defined such that:

$$W^R = Z + \frac{\omega}{\rho}\int_{W^R}^{\infty}\left(W - W^R\right)dF(W) \tag{3}$$

or equivalently

$$W^R = Z + \frac{\omega}{\rho}\int_{W^R}^{\infty}\overline{F}(W)dW \tag{4}$$

where $\overline{F}(W)$ is the complement of $F(W)$, that is $1–F(W)$ and referred to as the survivor function.

The individual's conditional expected wage is $E(W \mid W > W^R) = W^*$, which is not less than μ, the unconditional mean of the wage offer distribution. The higher W^R, the higher W^*. The job search literature focuses on the duration of unemployment—the time it takes to receive an acceptable wage offer, which is determined by the rate of arrival of offers and the fraction that are acceptable as given by $\omega \overline{F}(W^R)$—and the role of unemployment benefits through their impact on the reservation wage in determining spell durations. But it also implies that an unemployment benefit leads to higher wages.

We assume that individuals are continuously employed, but not immediately. At the onset of period 2 the adult child faces uncertainty associated with finding an acceptable job offer. In this search process job offers arrive at a constant rate, but the parent also transmits an endowment to the child that we interpret as a certain job offer with a particular firm, the firm at which the parent is employed. The wage associated with this firm is known by the child. This is the re-interpretation we give Z, which we refer to as Z_t, and as in Becker and Tomes (1986, pp. 251-252) with respect to their reference to family "connections" we assume that $\delta Z_t / \delta Y_{t-1} > 0$. Higher earning parents are employed by higher wage firms, and any potential job offers these firms extend to the adult children are higher paying. In other words, Z_t, influences the child's reservation wage so that $l_t(Z_t)$ enters as the last term in equation (1), and represents the realization of a draw from a conditional rather than an unconditional distribution, when the values are standardized. Individuals with higher earning parents have higher reservation wages; individuals with higher reservation wages have higher earnings.

If Z_t is taken to be the wage the individual would earn with certainty if employed by the same firm as the parent it must be that this is a job for which the individual need

not search, knowing its location and characteristics from the parent. This intergenerational transmission is given as equation (5), where ϕ is a function reflecting the firm's wage policy as it relates to parental income.

$$Z_t = \phi(Y_{t-1}) \tag{5}$$

This is non-stochastic. There may be no possibility of parents passing on information and connections of the sort that lead to a job offer from their employers to their children. It may be the case that parents' have reputations or attachments to the labour market that are weak and intermittent and do not lead to the types of contacts resulting in employment for their children; that parents are familiar with the hiring practices of their firms but these do not permit the intergenerational transmission of employment with a high degree of certainty; that parents are familiar with the state and growth of labour demand in the firm and are aware that no hiring is taking place at all. If this is the case then $\phi(Y_{t-1}) = 0$, and the children know that they cannot obtain a job through contacts inherited from their parents.

But in other cases $\phi(Y_{t-1}) > 0$, and children know with certainty that there are job offers to be had in the same firm that employed their parents. The parents either pass this information on without any cost to their children, or the children know the location of the firms and obtain this information directly. In this way the value of $\phi(Y_{t-1})$ reflects the institutional make up of the labour market and the segment of the market parents occupy. Further, we assume there is a positive correlation between parental earnings and the wage offer that their children could receive from their employers so that $\delta\phi/\delta Y_{t-1} > 0$. For example, Shea (2000), among others, hypothesizes that fathers in unionized jobs are able to pass on employment with the same firm to their sons. These employment rules are

known by parent and child. Further, the union-non union wage premium implies that the children of these relatively higher earning fathers will also get a relatively higher wage offer from the firm. More generally, Atkinson, Maynard and Trinder (1983) note that this tendency will also depend upon the diversity of the local labour market and the hiring practices of firms. In their study of intergenerational earnings mobility in the city of York the local labour market was dominated by a single employer, making it more likely sons would be employed at the same firm as fathers and more likely that the firm, even in a non-unionized setting, will adopt a preferential hiring practice of this sort. Either way this information is available to the child with certainty, and for these reasons it is transmitted across the generations in a manner different than depicted in equation (2) for other endowments. Further, this being a dominant or large employer in the labour market may also suggest a dominant position in product markets so that the firm's revenues and hence wage setting policies may incorporate a rent that is shared with workers. This suggests that there is a wage premium to be had by employment in this firm, reflecting the type of arguments used to understand persistent inter-industry wage differences or the higher wages paid by large, perhaps more productive, firms.

Our concern is with the impact Z_t has on the reservation wage of the child. Lancaster and Chesher (1983, pp. 1664-65) show that $\delta W^R/\delta Z = 1 / [1 + \omega \overline{F}(W^R) /\rho] > 0$ by differentiation of (4), and hence that the associated elasticity is $\delta lnW^R/\delta lnZ = [Z/ W^R] \times [1 / [1 + \omega \overline{F}(W^R) /\rho]]$.[2] With $\omega = \rho = 1$, if a job offer is received every period and if there is no discounting, we can say that $\frac{1}{2} \leq \delta W^R/\delta Z \leq 1$ from the properties of the survivor function. This also implies that the associated elasticity is positive but does not

[2] These results continue to hold with the reinterpretation we give to Z if $\delta F(W)/\delta Z = 0$, that is if a marginal change in one firm's wage does not change the distribution over all firms.

exceed 1. In other words, changes in Z can have a significant impact on W^R and this impact will be non-linear for wage distributions that are usually taken to characterize the distribution of wages and earnings, that is, as having a central tendency and smaller, though not necessarily symmetric, tails. This follows from the nature of the survivor function, falling from 1 to 0 as the value of W^R increases, and experiencing its greatest changes at those points in the distribution with greatest mass.

To interpret this in the context of equation (1) Z_t , W^R , and W^* should be viewed as standardized deviations from the mean. In this way $\gamma_t H_t(x_{t-1}, s_{t-1}, E_t)$ can be thought of as determining the mean of the wage offer distribution the individual faces, with the realization of $l_t(Z_t)$ as the deviation from the mean determined by the optimal job search decision.

Any value of Z_t will influence the child's actual wage as long as it is greater than the lowest possible offer the individual could receive. Two individuals of equal ability and human capital, and hence facing the same job offer distribution, will differ in their expected wage outcomes if one has a positive Z_t. With $\delta Z_t / \delta Y_{t-1} > 0$ this represents the channel through which parental earnings determine child outcomes even if capital markets are perfect. Obviously, $Z_t > 0$ does not mean the individual is necessarily employed with the same firm that employed the parent, that probability being simply $F(Z_t)$. However, $F(Z_t)$ increases monotonically in value with Z_t so, if $\delta Z_t / \delta Y_{t-1} > 0$, the incidence of same firm employment is higher, the higher the parent's earnings. For very high values of Z_t it is very likely the child will be employed at the same firm as the parent. In other words we should observe an increasing incidence of the intergenerational transmission of employment with increases in parental earnings: holding ability constant,

children of higher earning parents are more likely to be employed with the same firm that employed their parent because their higher reservation wages imply a lower likelihood of receiving better offers from other firms. At the very top of the parental earnings distribution it is much more likely that employers are passed on across the generations in this way. In other words this positive relationship should also have a non-linear pattern, and be very high at the upper end of the parental earnings distribution.

While the lowest probabilities of intergenerational inheritance of employers are among those children of the lowest earning parents, this does not mean that $Z_t > 0$ does not have an impact on their accepted wage. This impact, however, will be weaker the farther the child's value of Z_t is from the mean wage offer. If Z_t / W^R is very small the parent's job contacts are of little use to the child. That is, all job offers the child may receive are well above those the parent could offer up. For example, this would be the case for a high ability child, who consequently has a high level of human capital, but whose parent was low income and working in a low income firm. The child's level of human capital allows sampling of offers from segments of the labour market with a mean offer distribution much greater than Z_t. The job offer from the parent's firm pays very much below anything the child could obtain elsewhere. So W^* may be approximately μ, if Z_t is very low.

This also implies a life cycle pattern in the probability of employment with the same firm as the parent. Before the child completes formal schooling or obtains significant work experience and on-the-job training the wage offer distribution will have a low mean, and it is more likely that Z_t is relatively significant in magnitude. But as the child's human capital increases, the job offer distribution faced shifts to higher and higher

wage rates, making Z_t relatively less significant, and reducing the likelihood that the offer from the parent's firm is acceptable. This pattern will depend upon the optimal level of the child's human capital and the value of Z_t , being more evident for high ability children of low income parents.

b. Borrowing constraints in capital markets

Standard models of the transmission of earnings across the generations also predict that parent-child earnings will be correlated for reasons other than the intergenerational transmission of endowments. In Loury (1981) and Becker and Tomes (1986) it is recognized that some parents may not be able to invest the optimal amount of human capital in their children if there are borrowing constraints in financial markets that prevent the passing on of debt for repayment in the next generation from the increased earnings of the child. Parents must fund these investments by reducing their own consumption. This implies that the cost of funds are not the same across families, and also that they are increasing in the level of expenditures on the child's human capital as the reduction in consumption raises the shadow cost of additional expenditures. The incomes of some families will be high enough to make the optimal level of expenditures, but this will not be the case for other families. In Becker and Tomes (1986) this was described to be the case for low income families, and as such a direct channel is opened between the earnings of parents and their children making the intergenerational tie in earnings stronger than it would have been had the optimal level of human capital expenditures been made. This model predicts a non-linear and concave relationship between parent and child earnings, when the impact of different degrees of parental

altruism and heterogeneity in child ability and its correlation with parental earnings are ignored.[3]

Figure 1, adapted from Becker and Tomes (1986), illustrates the nature of capital markets and the underinvestment in human capital by virtue of low parental income. The curves *HH* represent the demand curves, and the curves *SS* represent the supply of funds. The former are drawn for a given level of E_t, the latter are drawn for a given level of Y_{t-1}.[4] A child with endowment E^0 from parents with income Y^0 will have less human capital, $0X^0$, than a child with the same endowment but whose parents had income Y^1, namely $0X^1$, as illustrated by the contrast between points *A* and *C*. This can be readily adapted for a model with two types of endowments. In our case the demand for human capital is not influence by Z_t since it enters the earnings generating function additively, not changing its slope. But Z_t can also be thought of as relaxing the borrowing constraint, and as such shifting the *SS* curve outward.

To show this we follow Mulligan (1999) and consider a liner version of the model with the adult earnings of the children and their level of human capital determined according to equations (6) and (7).

$$ln\ Y_t = \gamma_t\ ln\ H_t + \lambda\ ln\ E_t + \phi\ lnY_{t-1} + \varepsilon_t \tag{6}$$

$$ln\ H_t = \delta\ ln\ E_t + \theta\ lnY_{t-1} \tag{7}$$

In equation (6) earnings depend upon two types of endowments, ability E_t as discussed in equation (2), and parental job contacts where $l_t(Z_t)$ is represented for simplicity as $\phi\,(Y_{t-1})$

[3] Grawe (2004), Grawe and Mulligan (2002), Han and Mulligan (2001) point out that with heterogeneity in child abilities and parental altruism the relationship between parental income and being credit constrained is not straightforward and cannot be easily determined empirically.

[4] We abstract from the possibility that endowments may be correlated with parental income, and therefore maintain that the demand curves for human capital investment do not shift even when parental income changes.

$= \phi \, lnY_{t-1}$. This leaves ε_t to represent market luck. Equation (7) refers to the behaviour of parents constrained in the capital market. The child's level of human capital is higher the more able the child, but also the higher the income of the parents. Therefore $\theta > 0$ reflects the idea that capital markets are not perfect so that the child's level of human capital depends on parental income.

These equations imply that $ln\ Y_t = (\phi + \gamma_t \theta)\ lnY_{t-1} + (\lambda + \gamma_t \delta)\ ln\ E_t + \varepsilon_t$. So for children of the same ability E_t the child with higher income parents will have more human capital and ultimately higher expected earnings because this family is less severely constrained in the capital market. In the standard borrowing constraints model with one dimension of ability this effect is given by $\gamma_t \theta$, but this impact is accentuated by the presence of the second type of endowment so that the ultimate elasticity between parent and child earnings for children with equal E_t is $(\phi + \gamma_t \theta)$. The presence of the intergenerational transmission of employment eases the borrowing constraint: any given difference in income between parents of equally endowed children will lead to a higher difference in their human capital accumulation, and hence earnings, if the higher income parent also has a job contact that is passed on.

This is illustrated in Figure 1 as the distinction between points *A* and *C* for families with incomes Y^0 and Y^*. Let $Y^0 < Y^*$ so that families with lower parental income are in equilibrium at point *A* investing $0X^0$ in their children; families with the higher income are at point *B* investing more in their children because this additional income eases their borrowing constraint. The latter children earn more in the labour market not because they are any more able along dimension E_t, but because their parent's higher income permits more investment in their human capital. But for these higher income

parents it is more likely that $\phi > 0$ since the value of job contacts is positively correlated with parental income, suggesting that the equilibrium level of investment is even higher at point *C*.

An alternative way to see the same point is to note that equations (6) and (7) also imply that $ln\ Y_t = (\gamma_t + \frac{\lambda}{\delta})\ ln\ H_t + (\phi - \frac{\lambda}{\delta}\theta)\ lnY_{t-1} + \varepsilon_t$. For two groups of children with the same level of human capital it must be that the group with lower income parents have children who are more able, that is have higher E_t. This is illustrated as the distinction between points *C* and *D* in Figure 1. Let $Y^0 < Y^* < Y^1$ and let $E^0 < E^1$. Families with lower parental income are in equilibrium at point *D* investing $0X^1$ in their relatively higher ability child; families with higher income are at point *C* investing this same amount in their relatively lower ability child. The former children earn more than the later because the labour market rewards not only their human capital but also their higher level of the endowment. So for the two groups together parent-child earnings are negatively correlated, as indicated by $-(\lambda/\delta)\theta$.

However this negative relationship need not be as strong or need not hold in the case of $\phi > 0$. When $\phi > (\lambda/\delta)\theta$ there is in fact a positive relationship between parent and child earnings for a given level of human capital. This happens because higher income is associated with a higher Z_t. Among the children with human capital of $0X^1$ there is a group whose parent's income is Y^*. The optimal level of human capital investment for these children would be determined by equilibrium at *B*, but since job contacts are positively correlated with parental income these families reach equilibrium at point *C* and human capital $0X^1$.

In other words, the intergenerational transmission of job contacts work to ease the borrowing constraint. The shadow cost of funds for parents is lower because the increase in their child's earnings are greater for each additional unit of human capital compared to parents without job contacts. Another way of thinking of this might be that parents invest more in their children in order to give them the credentials needed to qualify for at least the job they are able to pass on to them. As such even if Z_t is assumed not to change the demand for human capital investment, it does change the supply of funds and influences the amount of human capital.

All of this suggests that the intergenerational earnings elasticity in a regression to the mean model will be stronger in the presence of intergenerational transmission of employers; job contracts from the parent serving to accentuate the standard result from the imperfect capital markets model that parent-child earnings are correlated through a direct channel. Equations (6) and (7) and the calculations in Solon (2004) imply that β, the intergenerational earnings elasticity usually estimated by least squares in a linear regression to the mean model, will be:

$$\beta = \frac{(\phi + \gamma_t\theta) + (\lambda + \gamma_t\delta)h}{1 + (\phi + \gamma_t\theta)(\lambda + \gamma_t\delta)h}. \tag{8}$$

So in the presence of imperfect capital markets, the possibility of intergenerational transmission of employers, that is of $\phi > 0$, leads to β being larger than it otherwise would be.

c. Summary

In the standard model of intergenerational earnings mobility with perfect capital markets all adult children with the same human capital have the same endowment along the

dimension that determines the optimal level of human capital investment. This implies that they all have the same anticipated earnings, which are unrelated in a causal sense to parental income. With earnings determined by two types of ability, the dimension we are referring to as the intergenerational transmission of job contacts is not the same for all adult children with the same level of human capital. Parental job contacts do not change the optimal level of human capital, but because they are correlated with parental earnings the earnings of children are positively related to parental earnings. This result is in contrast with the uni-dimensional view of ability in the perfect capital markets model, and is also reached by Mulligan (1999), though in the present case an explicit rationale through the job search process is offered for a non-linearity in the relationship between parent-child earnings.

In the standard model of intergenerational earnings mobility with imperfect capital markets children with the same endowment will have different levels of human capital and hence earnings according to their parental income. Children have different anticipated earnings in a way that is positively associated with parental income in a causal sense. With earnings determined by two types of ability, the dimension referred to as the intergenerational transmission of job contacts is not the same for children with the same level of human capital. Parental job contacts change the optimal level of human capital because they ease the borrowing constraint. Higher parental earnings imply even higher levels of human capital investment because they are also associated with a higher value of job offers upon which children can rely.

The use of a model with two dimensions of ability, and the interpretation of parental job contacts as having two possible influences depending upon the nature of

capital markets, also has predictions for the incidence of same firm employment across the generations. The perfect capital markets model in conjunction with the standard job search model implies that: (1) the incidence of intergenerational transmission of employers is positively associated with parental earnings, in a non-linear way and being disproportionately higher for the highest earning parents; (2) the incidence of intergenerational transmission of employers is higher at early stages of the life cycle before human capital accumulation, both formal schooling and on-the-job or post-schooling investment, is completed; and (3) the intergenerational earnings elasticity is higher, that is mobility is lower, when children can rely upon their parents job contacts.

3. Nature of the data and some preliminary results

Our analysis is based upon the Intergenerational Income Data (IID) developed at Statistics Canada from administrative information on individual income tax returns that have been grouped into families. Canadians file their income tax returns (so-called T1 Forms) on an individual basis, and Statistics Canada has grouped these into families using a variety of matching strategies that are described in Harris and Lucaciu (1994). The resulting T1 Family File (T1FF) is the basic building block for the creation of the IID, an intergenerational linked set of T1 Forms for a series of cohorts of young men and women, and their mothers and fathers. This represents not quite four million individuals and their parents, and in particular 1.9 million men who are the starting point for our research. We focus on the male cohort born between 1963 and 1966, and in fact for the most part the oldest subset born in 1963. These individuals are linked to their fathers—not necessarily their biological fathers—if they filed an income tax return between 1982

and 1986 while still living at home. This is required to ensure that a parent-child match is made, and also that the child has an observed Social Insurance Number (SIN), a unique individual identifier that can then be used to link all subsequent T1 Forms which contain information on earnings. These T1 Forms are available for all years between 1978 and 1996.[5] The sample sizes associated with the creation of our analytical files are detailed in Appendix Table A1, which makes clear that they are large—measured in the tens and hundreds of thousands—given that the data potentially represent the universe of individuals in these age groups.

Versions of these data have been used by Blanden (2005), Corak (2001), Corak, Gustafsson, and Österberg (2004), Corak and Heisz (1999), Grawe (2006, 2004), Oreopoulos (2003) and Oreopoulos, Page and Huff Stevens (2005) to study a host of issues dealing with intergenerational mobility. Our application is unique in that we further develop the data by adding information on the specific firms employing parents and children throughout the period they are observed. We do this by relying upon a longitudinally consistent catalogue of all enterprises in the country, linked to individuals through the earnings remittance forms issued to employees (the T4) and used to support their income tax returns. This database of firms is referred to as the LEAP.[6] Each T4 has a payroll deduction account number unique to a firm, and the LEAP serves to aggregate the possibly many account numbers per firm into a single longitudinally consistent

[5] The algorithm used to create the data leads to an under-representation of children from lower income backgrounds, and from the major metropolitan areas: Montreal, Toronto, and Vancouver. This reflects the fact that children who leave home early or who otherwise are not engaged in the labour market while at home are less likely to be linked to a parent. It also reflects the fact that new immigrants and their children will be under-represented in the data, the majority having a tendency to settle in the three major cities of the country. Weights based upon Census data have been created to account for this, and our analysis uses them throughout even though they make no difference to the results.

[6] The acronym refers to Longitudinal Employment Analysis Program. See Statistics Canada (1992, 1988) for a description of its construction and use.

identifier. For each individual (fathers and sons), and for each year from 1978 to 1996 we obtain unique firm identifiers for up to four employers. Very few individuals ever have more than four different employers in any given year. Using the individual's earnings from each employer we designate for a given year the firm accounting for the majority of total earnings as the "main" employer in that year, or sometimes over a five year horizon according to our analytical needs.

The LEAP offers an accurate representation of the private sector but our analysis of the intergenerational transfer of employers is hampered by the fact that it does not distinguish separate employers in the public sector.[7] For anything finer than a two digit industry analysis this will overstate the degree to which employers or industries are passed across the generations. In order to recognize this we produce a set of results for two separate definitions of whether there is a match of employers between fathers and sons: one in which employment in the public service for both the father and son is considered to represent same firm employment, and one in which it is considered to be missing information on same firm employment. In fact, the findings did not vary significantly in kind, though there are differences in some of the descriptive results, with the former definition leading to a higher incidence of intergenerational transmission of employers. Accordingly we report in what follows on the results that consider such observed matches to be missing information, and as a result note that the analysis offers conservative estimates of the degree of intergenerational job contacts.

Table 1 presents basic descriptive information. Father's earnings are averaged over the five year span in which the son was 15 to 19 years of age. To remain in the

[7] This refers to the federal and provincial public services but not to municipal governments.

sample the father must have positive earnings in each of these five years.[8] On average fathers are in their mid forties when we estimate their permanent earnings. This corresponds roughly to the ideal phase in the life cycle suggested by Haider and Solon (2006) to make these calculations in their analysis of the US Panel Study of Income Dynamics. Sons' earnings are averaged over a three year period, 1994 to 1996, conditional on reporting positive earnings in each of these three years. As such the sample of sons is relatively young. This is likely to lend a downward bias to estimates of the intergenerational earnings elasticity, and for this reason we focus most of our analysis on the oldest cohort available to us (those who are 33 years old at the end of the sample period). Some of descriptive results suggest that this is not likely to influence the degree of intergenerational transmission of employers. This restriction also simplifies many of the calculations and makes the sample size—at just over 70,000—more manageable.

We work with two alternative definitions of whether or not a son is employed by the same firm as his father. The first is the broader measure, and the main focus of our attention. According to this measure the son is said to have the same employer as his father, during any given year from the age of 16 onward, if the father was also employed by this employer at any point in the past, as far back as the son's 15th year. That is, we define a vector of same-employer indicators that are set equal to one in year *t* if any of the son's employers in year *t* were the same as any of the father's employers over the period 1978 to *t-1* inclusive. This definition of the intergenerational transmission of employers involves up to four different employers per year for both sons and fathers. At age 33 it

[8] This is the preferred sample selection rule in Corak and Heisz (1999). They show that averaging over a five year horizon is long enough to correct for transitory earnings fluctuations. Mazumder (2005) suggests that almost twice as many years are necessary to correct for persistent transitory earnings fluctuations in the US administrative data he uses. However, unlike these US data the earnings information from the IID is not top coded.

represents the life time incidence of the intergenerational transmission of employers showing whether the son at any point since the age of 16 had the same employer as his father. Our starting point is to interpret this measure as the presence of an intergenerational network; though with error since the son could have found the job without relying upon the father, or the son may never have been employed at a same firm even if he had the opportunity. The second definition results in a narrower measure, referring only to the main employer: the employer accounting for the majority of earnings. For the most part we restrict this to mean the main employer the father had during the son's teen years, more specifically from 15 to 19 years of age, and the main employer the child had between ages 30 and 33.

In Table 2 we offer some preliminary least squares estimates of the intergenerational elasticity, meant to replicate earlier research and set the tone for our analysis. The results refer to the standard regression to the mean model used in this literature, namely $lnY_{i,t+1} = \alpha + \beta\, lnY_{i,t} + \varepsilon_i$ where lnY indicates the natural logarithm of permanent income, $t+1$ the son's generation and t the father's for family i, while α is a constant reflecting the earnings common to all individuals in the cohort of sons, and ε_i is a residual term. The objective of the exercise is to accurately estimate β, the intergenerational elasticity of earnings. This is what is offered in the table for a number of different samples. The overall estimate for all age cohorts of 0.226 is exactly in accord with other studies that have used these data and other Canadian data for this purpose, as reported in particular by Corak and Heisz (1999, table 3) and Corak (2006). But the table also shows a series of separate regressions for sub-samples according to whether the son and father shared the same firm. This is for illustrative purpose, as it assumes that the

sample separation into those who rely on a parental contact and those not able to is known, exogenous, and perfectly indicated by whether they actually worked for the same firm or not. The estimation results show that the sample of sons employed at the same firm as their father, whether this is defined in the broadest or narrowest sense, has an intergenerational earnings elasticity that is significantly higher. At the extreme when the analysis refers to the same main employer the estimate is 0.4, a value this high never being reported by any other Canadian study using a linear specification.

But previous research, notably Corak and Heisz (1999) and Grawe (2004), also shows that the linear regression to the mean model is mis-specified in these data. The IID offers a large number of observations of high quality earnings data and permits an assessment of whether the data generating function is nonlinear. We offer in Figure 2 a replication and extension of the results in Corak and Heisz (1999) using non-parametric nearest-neighbourhood estimators, the most flexible technique available. Panel A presents the results for the entire data set of all three age cohorts, those 30 to 33 years of age, clearly indicating distinct non-linear patterns. The elasticity rises over the lower half of the father's earnings distribution from 0 at the very bottom and reaching just about 0.3 at the mean. It then falls in the upper half, before rising sharply at the very top of the father's earnings distribution. Panel B focuses on just the 33 year olds, indicating a similar pattern and magnitude, though rising above 0.3 at the mean. But the results are less precisely estimated at the very top. The standard deviation in these data is about 0.5, with the value of 1.0 on the horizontal axis indicating two standard deviations above the mean. Between 2 and 4 standard deviations the patterns in the two figures are the same, reflecting an upturn in the elasticity. Beyond that they differ. The sharp run up at the very

top indicated in Panel A is not evident in Panel B, though the confidence interval of two standard errors is very wide and does not exclude it. We attribute this difference to the fact that the nearest-neighourhood estimator is not as precise at the boundaries of the data set, with the reduced sample size playing a role as a few data points appearing in one data set but not the other changing the results.

We also estimate this model for the sample of 33 year olds according to the same-firm definitions in the second and third panels of Table 2. These results are presented in Figures 3 and 4. The intergenerational earnings elasticity is much higher throughout the father's earnings distribution for those sons having the same employer as their fathers. For example in Figure 3 the intergenerational elasticity for this group never falls below 0.2, but for those not experiencing the intergenerational transmission of an employer it only reaches this value at its maximum. The elasticity is also relatively much higher at the very upper tail as it tends to fall off throughout the upper half of the earnings distribution for sons not employed at the same firm as their fathers. This suggests that part of the preservation of earnings across the generations for the very top earning fathers has something to do with the intergenerational transmission of employers. In fact, the negative estimate at the very upper end of the distribution for those not having the same employer as their fathers indicates an intergenerational reversal of earnings. All of this is particularly so in reference to the more narrow measure of same firm employment: when the son has the same main employer as an adult that his father had 15 or so years earlier the intergenerational earnings elasticity is in the ranges from 0.5 to 0.8 when earnings are more than two standard deviations from the mean. In addition, for the large part of

distribution in the lower half of the earnings distribution the value is also notably high at about 0.5.

4. The incidence of intergenerational transmission of employers

There is a high "life-time" incidence of intergenerational transmission of employers. By 33 years of age just over 40% of sons are employed, or have been employed, at an employer that had at one time also employed their fathers. These results are presented in Figure 5, illustrating the proportion of sons who at any give age ever worked for an employer that at some point also employed their fathers. This is a cumulative variable that can only increase with time. At the age of 33 years 41% of Canadian men were working, or worked at least once between 1978 and 1996, for an employer who had at some point employed their fathers.

The rate of increase in the incidence of same firm employment slows significantly after about age 25, and is relatively flat after age 30. This reflects a particular life cycle pattern, one that is roughly in accord with the pattern of human capital accumulation, and the predictions of the model discussed in the previous section. The intergenerational transmission of employers is highest in the early stages of the life cycle as individuals are making the transition from formal schooling to work, with the largest changes occurring between the ages of 18 and 22. It increases from 10% to 30% during the teen years, and then rising more slowly to 40% during the 20s, with little change after the age of 30. This is more explicitly illustrated in the two panels of Figure 6, which offers the life-cycle patterns for three alternative definitions of the father's job contacts. The focus is on the current employer of the son rather than on life-time incidence. In Panel A the reference is

to any employer the father held in previous years, while in Panel B it is to the father's main employer in the previous year, and also to his main employer when the son was 15 to 19 years of age. These parental contacts are related to any of the son's current jobs, and to the son's current main job. In all five possible cases the highest incidence of intergenerational employer transmission occurs between the ages of 18 to 22, when some sons have finished formal schooling while others are engaged or just completing their post-secondary schooling.

Panel A illustrates that at just under one-in-five sons in their earliest adult years work for an employer their fathers had also worked for at some point in the past: in the neighbourhood of 16 to 17 percent between the ages of 18 and 22. By the age of 33 this percentage is significantly lower but still important at just above 10%. Indeed, at this age just under one-in-ten have as their main employer an employer for which their fathers had also worked at some point in the past.

While this information suggests that the father's overall contacts are important, the information in Panel B illustrates that a large part of this has to do the father's direct contacts: that is, with the father's main employer in the previous year, and particularly the father's main employer during the son's teen years. At the age of 20 years just under 15% of sons are employed with the father's main employer of the previous year, and about 10 to 12% have as their current main employer the father's main employer of the previous year. This later percentage also holds when the son's current main employer is compared to the father's main employer during the period the son was 15 to 19 years old. These proportions fall off as sons get older, but remain around five to six percent at the age of 33. In fact at the age of 30 and beyond the main employer of the son is more likely to be

the same main employer the father had during the son's teen years than it is the main employer the father had in the previous year, likely reflecting changes in employment patterns among fathers at the later stages of the life cycle. The fact that direct contacts play the large part of the role in determining these life cycle patterns suggests that there is full information available to the sons about the possibility of obtaining employment from the firm playing the major role in determining the father's earnings.

These life cycle patterns are in accord with our theoretical predictions. They reflect the growth of the son's wage offer distribution as compulsory schooling is completed and as further investments in human capital, either formally through post-secondary education or through on-the-job training and work experience, are made and completed. As these human capital investments begin to generate a return the sons' wage offer distribution relative to that available from parental job contacts changes, raising the sons' relative wages among alternative employers and lowering the chances that they will be employed with the same firm as their fathers.

We do not have an exact way of verifying the assumption that higher parental income is associated with a higher wage offer for the child from the parent's employer. An observation that the incidence of same-employers across the generations is positively associated with parental earnings does not verify the idea that $\delta Z_t / \delta Y_{t-1} > 0$ since Z_t is unobservable, referring to the value of the job offer from the same employer, whether the child actually accepts the job or not. However, we do use the observed incidence of intergenerational transmission of employers to illustrate this possibility. Further, it is appropriate to use this indicator since one of the implications of the model is that the incidence of same-employer across the generations rises monotonically and non-linearly

across the parental earnings distribution, and potentially reaches very high proportions among the highest paid parents.

In addressing these issues we focus, first, on the relationship between parental income and the incidence of the broadest measure of the employment at the same firm as the father, which is used in Figure 5. The incidence of ever having worked with an employer that ever employed the parent remains imperfect, being conditional on the son having accepted at least one job offer, but it gets closest to measuring the scope for having a potential wage offer from the father's employer incorporating any of four possible jobs per year since the age of 15. A linear probability model of this indicator variable regressed against a constant and the natural logarithm of the father's permanent income yields a coefficient of 0.0369 when the sample includes only the oldest sons in our sample, those 33 years of age.[9]

Figure 7 illustrates, for this particular age group of sons, how the underlying proportions with same-firm employment change over the percentiles of the parental earnings distribution. Overall the incidence of same firm employment is 41% in these data, as given by the last observation in Figure 5. However, there is a clear non linear relationship across the father's earnings distribution. At earnings percentiles below the 70^{th} the incidence of same firm employment is never above 45%, hovering for the most part below 40%. At or above the 70^{th} percentile it is above this benchmark 12 times, and almost always above 40%. The proportion of sons employed at some point with the same firm that at some point also employed their fathers rises noticeably after the 85^{th} percentile, and then again sharply after the 95^{th} reaching 55% at the second highest percentile and almost 70 percent among the children of fathers in the top percentile.

[9] This also controls for the father's age and age squared.

Figure 8 offers a similar presentation using the more restrictive definition of same firm employment: main employer at age 33 matching the father's main employer when the son was 15 to 19 years of age. The overall incidence of same firm employment is 5.6%, but there is a clear positive tendency in this percentage across the father's earnings distribution with the highest proportions within the top 5%, and particularly the top percentile.

The patterns in these figures—a positive relationship in same firm employment with father's earnings, and non-linearities that are particularly evident at the highest percentiles of father's earnings—are also in accord with our theoretical predictions.

5. Estimates of the intergenerational elasticity of earnings

Our objective is to estimate the intergenerational earnings elasticity in a way recognizing that the population of sons consists of a mixture of two groups, those who have an intergenerational job contacts and those who do not. We frame this as an endogenous switching regression model as described by Maddala (1986, 1983), and implemented by Lokshin and Sajaia (2004). Our use of this is intended to account for the possibility that the decision to accept a job with the father's employer will be influenced by unobservables associated with the child's reservation wage and ability, and that these factors will also influence earnings. Fathers who are in a position to support and guide their sons' labour market search through their job contacts may also have influenced the development of other characteristics such as motivation and aspirations at an earlier stage. However, this assumes that sample separation is known, but as we have already suggested our information probably lends itself more appropriately to a case in which the

information about sample separation is imperfect. Some sons who are never observed to have been employed at a firm that once employed their fathers may still have their reservation wages influenced by the possibility that they could have such employment. Others who are observed to have had such employment could have found the employer on their own without relying on information or contacts from their parents. We leave to future work the estimation of this model as presented in Lee and Porter (1984).

However, it is relevant to once again note that our analysis focuses on the broader measure of same firm employment because it more closely measures the idea of a network. In particular, for most sons this variable will indicate whether the son relied upon his father's contacts to obtain his first job during the teen years, but not subsequently for his main adult job. As Figure 5 indicates, of those who are observed to have had the same employer as their father, three-quarters have done so by the age of 20. This variable is therefore likely to be a good measure of the kind of the relationship between parent and child that we are interested in; measuring the father's capacity to influence, or at least be engaged in, the son's interaction with the labour market. The intergenerational transmission of main jobs would be too narrow a measure of this influence.

Since this maximum likelihood procedure requires an empirical model of the determinants of whether a son inherits the possibility of employment with his father's employer we begin in an exploratory way with the specification of a series of linear probability models of same firm employment. This helps us to establish a reasonable specification appropriate for the maximum likelihood estimation, but is of interest in its

own right, empirically illustrating some of the determinants of the intergenerational transfer of employers discussed in our theory.

a. Linear probability models of intergenerational transfer of employers

The dependent variable is the broadest definition of same firm employment, the life cycle incidence as given in Figure 5. It is the last observation in this figure that is relevant, those 33 years of age with an overall life time incidence of just over 40%. Based upon our theoretical discussion we consider two sets of variables that may influence the chances a son has at some point worked for an employer for which his father has also worked: the individual characteristics of the father; the characteristics of the firm. The definition of these and associated descriptive statistics are presented in Table 3.

The father's earnings and earnings squared are included to capture the patterns illustrated in Figure 7, while age and age squared are used to control for life-cycle differences. The number of employers the father had over a ten year period is intended to indicate both the extent of the network the son may draw upon, and also the father's reputation. If the father has worked with many firms then this may imply a higher likelihood the son will be employed at a firm that also employed the father: there is simply a wider set of contacts upon which the son may draw. However, as the number of employers increases it may also signal a less reliable reputation. If it means, for whatever reason, that the father is not able to keep a stable job, then it may well be that past employers are less likely to hire his son. As such we can expect a non-linear pattern in this measure, and therefore also include the square of the number of firms. On average

fathers have 2.8 jobs over a ten year period, but the standard error at 2.9 is actually a bit higher than the mean. The maximum number of employers observed the data is 34.

The model also includes a series of 0-1 indicator variables for the presence of non-zero self-employment income over a five year period, be it from fishing, farming, professional, or from other more common sources of self-employment associated with incorporated or unincorporated businesses. These variables offer an indication of the degree of control the father has over the firm's hiring practices. It should be noted that throughout our analysis is based upon parental earnings, not total income. These indicator variables are derived from income tax declaration of other sources of income, and may also imply that the fathers total market income is not the same as total earnings. The value of self-employment income could be positive or negative, our concern not being with the amount but with the possibility that the father may have direct control over hiring practices. The most common situation is one in which we would expect the individual to have the most control over hiring, having some income from self-employment. About 11% of fathers are in this situation.

In order to measure the diversity of the employment prospects of the son we include a series of region indicators of where the father lived in 1986.[10] In a large city sons may have more employment options and be less likely to be employed at the same firm, than in rural areas. These indicators are derived from the first two digits of the postal code, and offer information on rural and urban areas as well as provincial and sub-

[10] In a small number of cases the postal code is missing in this year and we attempt to obtain it by referring to an earlier year, but back no further than 1982 when the postal code information begins to be reliably captured.

provincial regions.[11] Almost three-quarters of the observations are to be found in urban areas.

If the firm goes bankrupt and no longer exists it is less likely that the employer will be passed on across the generations. However, more generally it is not just the death of a firm that will indicate the prospects of the son's employment, but also the firm's hiring policy. If the firm decides to shrink in size through attrition it may choose not to hire younger people at all. To capture this we define a 0-1 indicator if there are any 30 to 33 year olds in 1996 employed by the firm. If there are none then the variable "Firm Death" takes a value of 1, otherwise zero. For the sake of simplicity we chose only the father's main firm when the son was 15 to 19 years of age to define this variable. This indicates that 42% of cases the father's main employers were not in a position by the end of the period to hire the sons.

The firm size at the onset of the period is also controlled for using a series of indicator variables. This refers to the total number of father's in our data employed by the firms, and not therefore to the total number of employees. Over 55% of fathers are in the smallest category, with the next highest proportions in the larger categories: 14% and 12% in firms of more than 100 and more than 500 of these workers.

Finally, we include a number of characteristics of the two digit industry to which the father's main firm is classified: the employment growth over the period, the average years of education of all employees, an interaction of this later variable with the father's

[11] The first digit of the postal code is a letter, which uniquely identifies a province with the exception of the larger provinces. Ontario is divided into five sub-regions, and Quebec into three. The second digit is a number that can be used to identify if the postal code refers to an urban or rural area. As such there are a total of 18 indicators for province/region, which in addition to the ten provinces includes two indicators for the three northern territories. An additional 0-1 indicator for rural/urban residence is also used. See www.canadapost.ca/personal/tools/pg/manual/PGaddress-e.asp for details.

income, and indicator variables for the two-digit SIC. These capture the overall chances of employment, the educational requirements—the ability to meet them potentially varying with the father's earnings—and any industry specific differences in hiring practices such as the rate of unionization.

The results for a series of specifications are presented in Table 4. The direction of the estimated affects all accord with our priors. The quadratic relationship between paternal earnings and the chances of same-firm employment is robust to the specification and illustrates a U-shaped tendency, being highest for sons from highest earning fathers; that between the number of employers the father had and chances of same-firm employment illustrating an inverted U-shaped relationship. Of the four indicators of the type of income only the indicator for self employment income is consistently statistically significant, having the expected positive sign. The firm death variable is negative, as is the indicator of urban residence. Finally, the use of the industry dummy variables seems to be clarify the role of firm size, their inclusion indicating that sons are more likely to be hired in smaller than in larger firms. The most important result in this table is the robust non-linear relationship between parental earnings and the probability of same firm employment, which supports—in this particular functional form—the assumption embedded in our theory.

b. Intergenerational earnings elasticities

The issue of how the job search process, and in particular the parental influence upon it, impacts on the estimate of the intergenerational earnings elasticity is examined in Table 5. A series of results are presented for various specifications of a probit model of same-

firm employment; the specifications from columns (3), (4), and (5) of Table 4. In the first two columns of Table 5 we re-estimate for reference the comparable intergenerational elasticities from Table 2 under the assumption of no sample separation, and of exogenous and known sample separation. The latter involves least squares estimation of a model using the entire data set of 33 year olds sons, but with each of the independent variables in the regression to the mean model being interacted with the 0-1 indicator of same firm employment. These should be contrasted with the remaining columns that use the full information in a way that recognizes the son's wage as being endogenously determined through the reservation wage and the impact of parental earnings and other characteristics upon it.

The results suggest that the null hypothesis that the sample consists of two separate sub-groups cannot be rejected. The relationship between parent and child earnings is much tighter—the intergenerational elasticity being about 50% higher—among those sons who can rely upon their parents in structuring their job search. The estimate of the intergenerational earnings elasticity for this group is about 0.3, compared to 0.2 for their counterparts who do not rely upon parental networks in finding a job. This said, the results are not qualitatively different than what is obtained by least squares.

6. Conclusion

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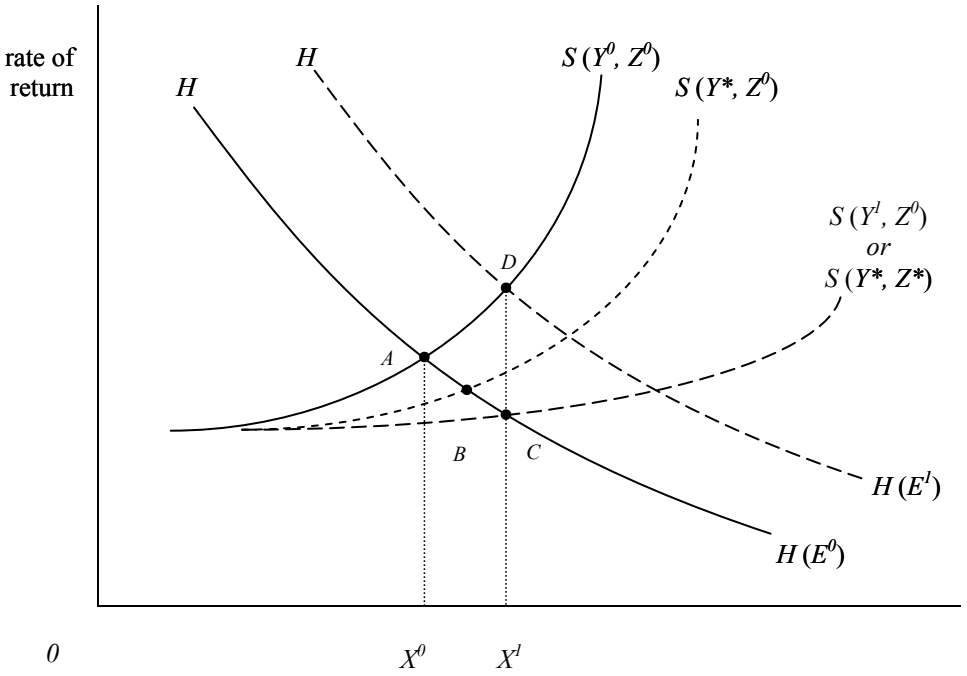
Figure 1
Capital markets for parental investment in children's human capital:
the impact of child ability, parental income and job contacts



Note: E indicates the child's inherited endowment with $E^0 < E^1$.
Y indicates parental income with $Y^0 < Y^* < Y^1$.
Z indicates the value of a job offer to the child from the parent's employer with $Z^0 = 0$, and $Z^* > 0$.

Figure 2
Intergenerational earnings elasticities estimated using nearest neighbourhood estimation

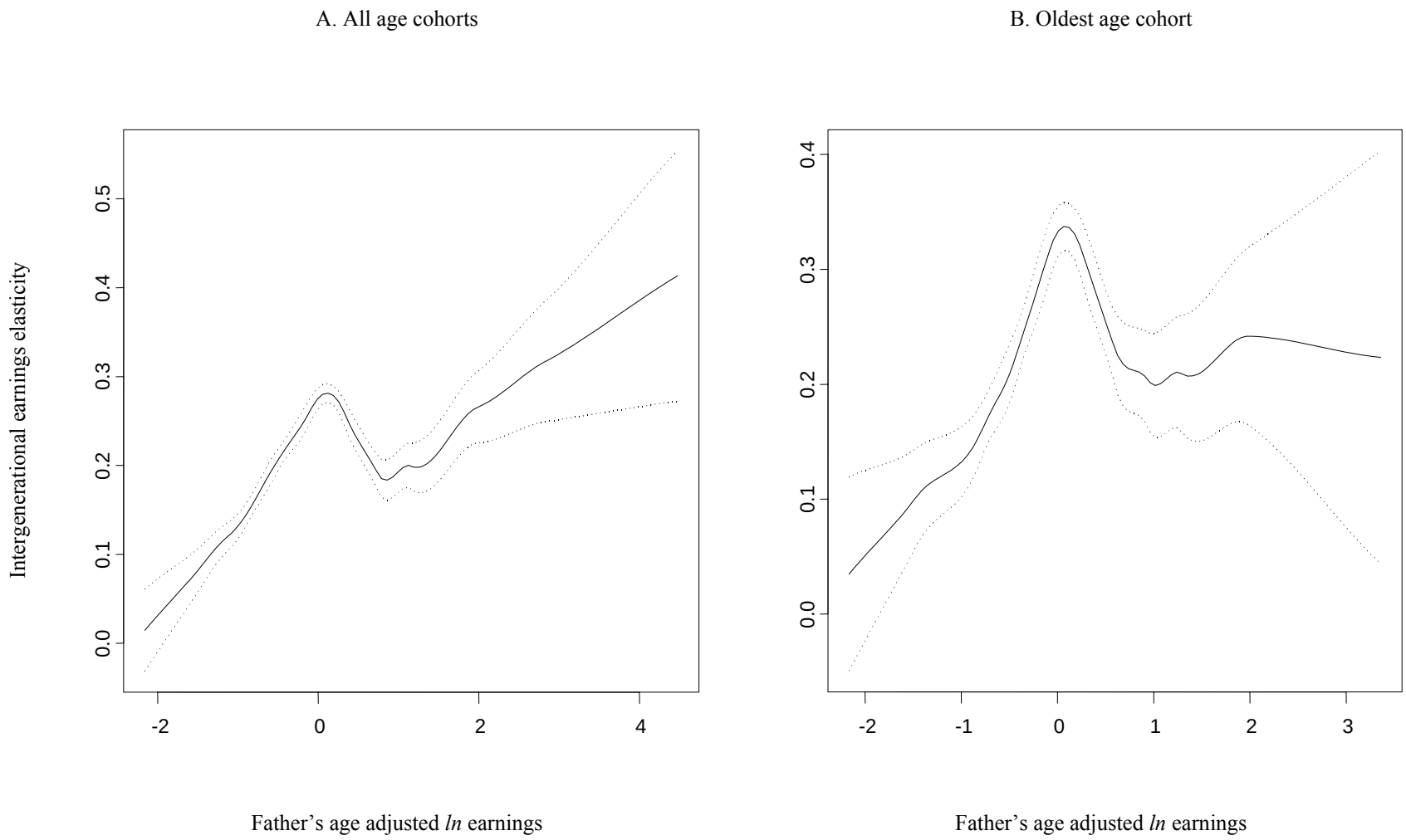


Figure 3
Intergenerational earnings elasticities estimated using nearest neighbourhood estimation: Oldest cohort, ever same employer

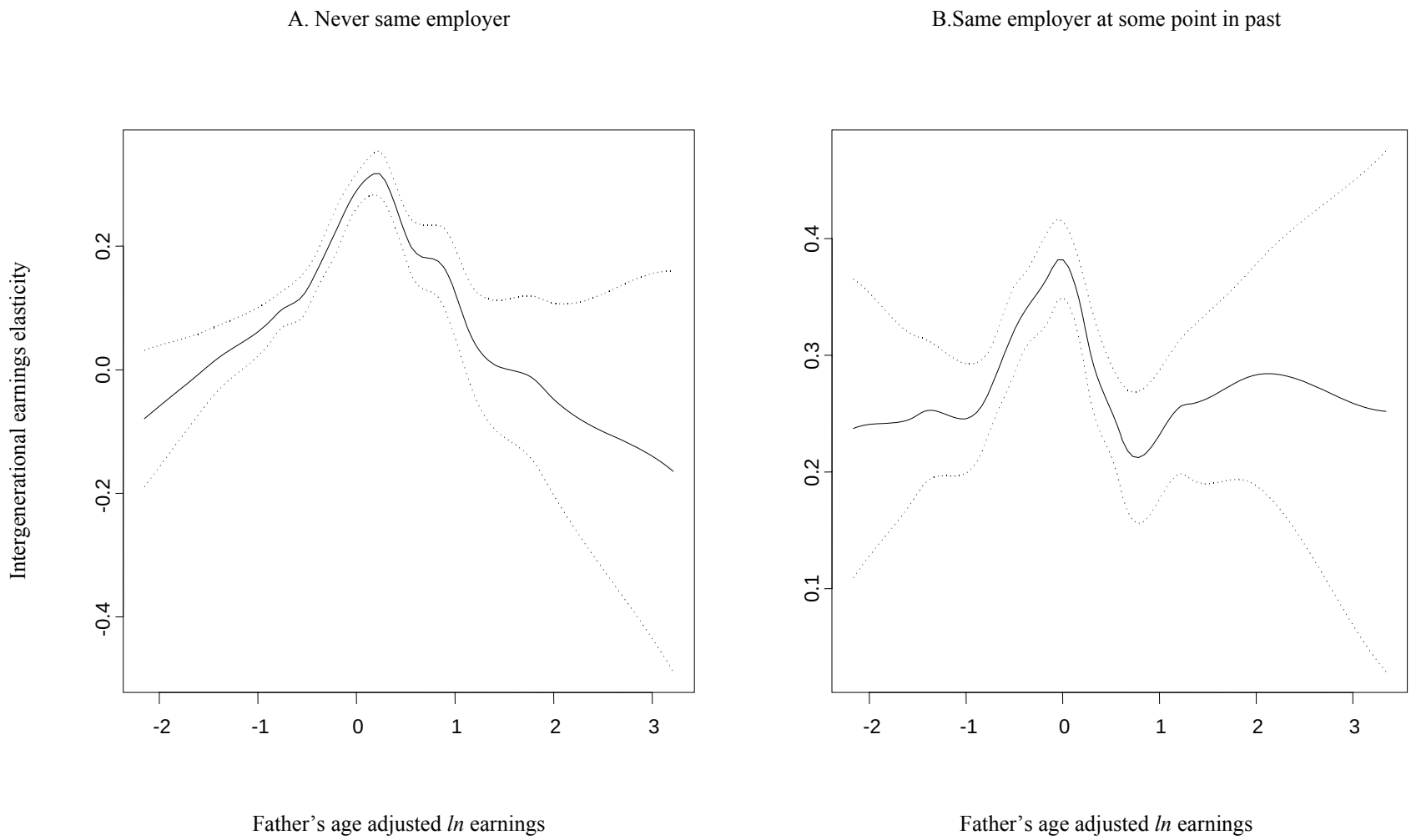


Figure 4
Intergenerational earnings elasticities estimated using nearest neighbourhood estimation: Oldest cohort, same main employer

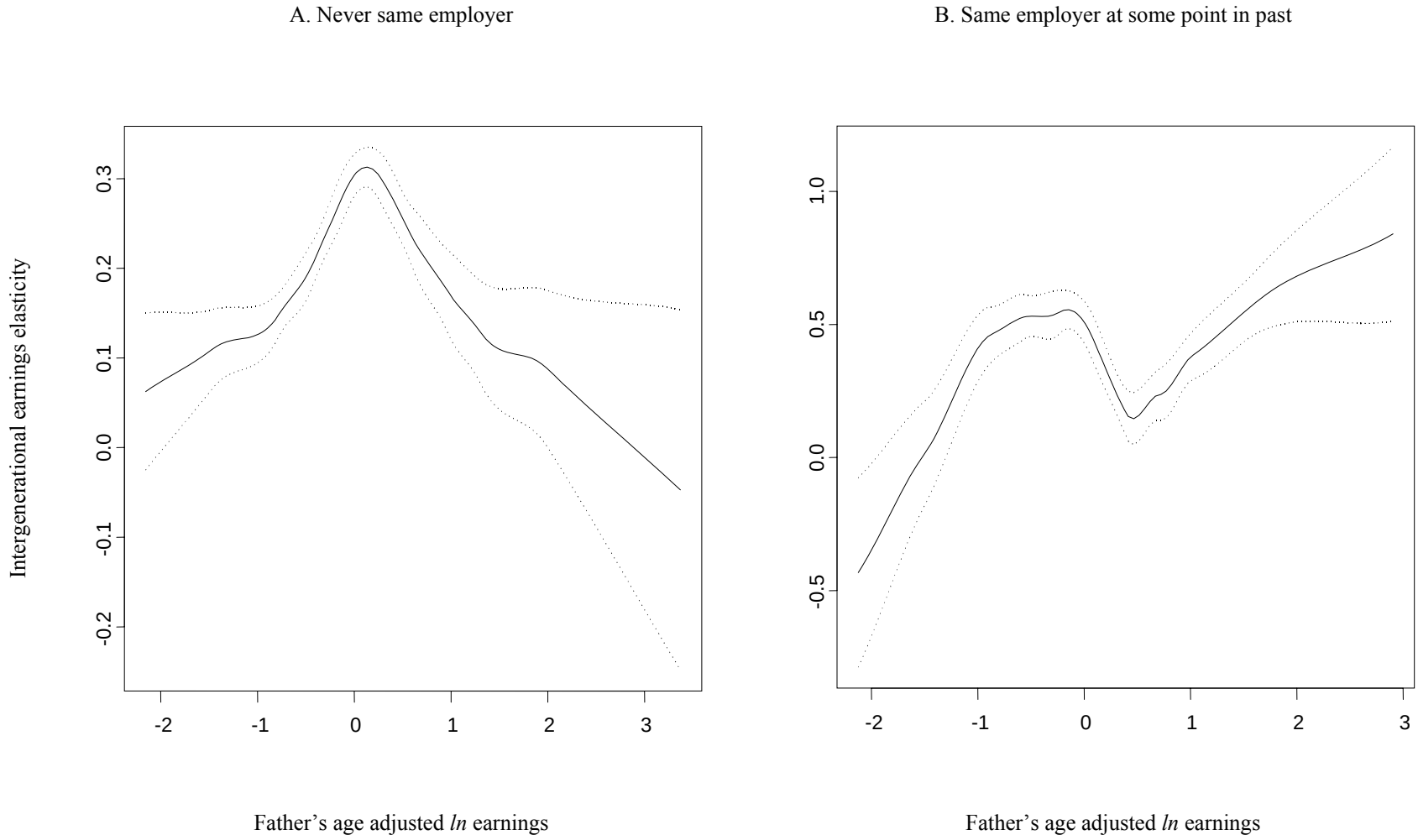


Figure 5
Proportion of sons employed currently or at some point in the past with an employer their fathers had worked for at any time in the past

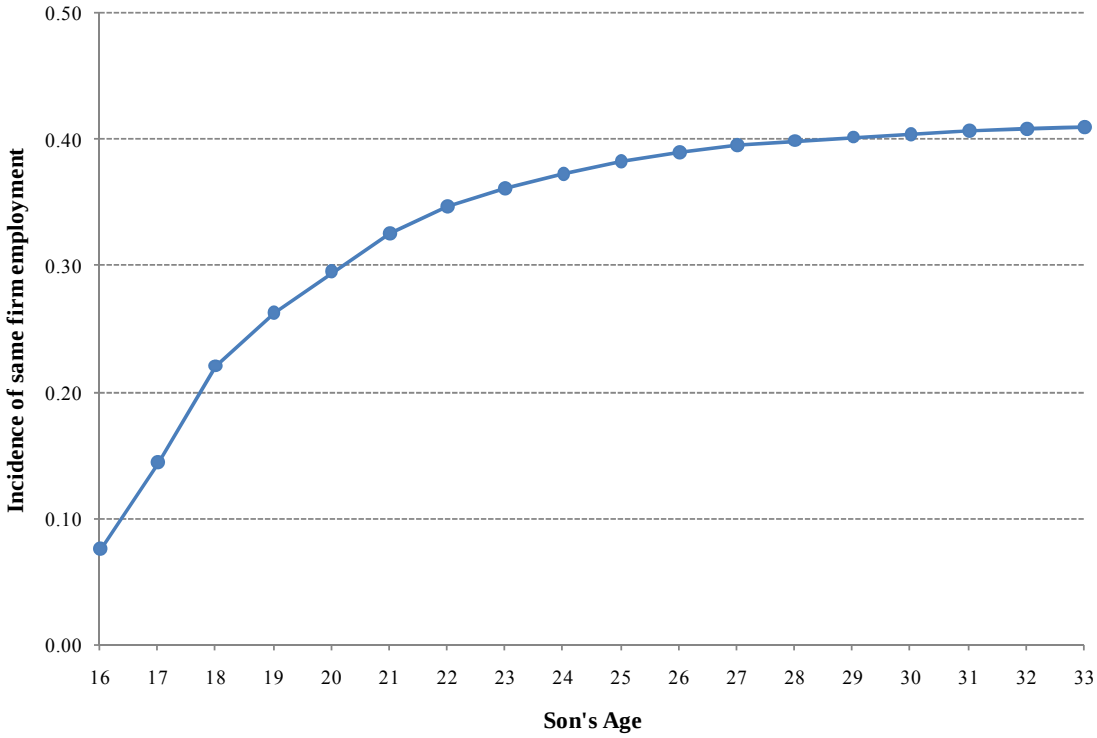


Figure 6
Proportion of sons employed currently with an employer their fathers had worked for at any time in the past, during the previous year, or during their teen years

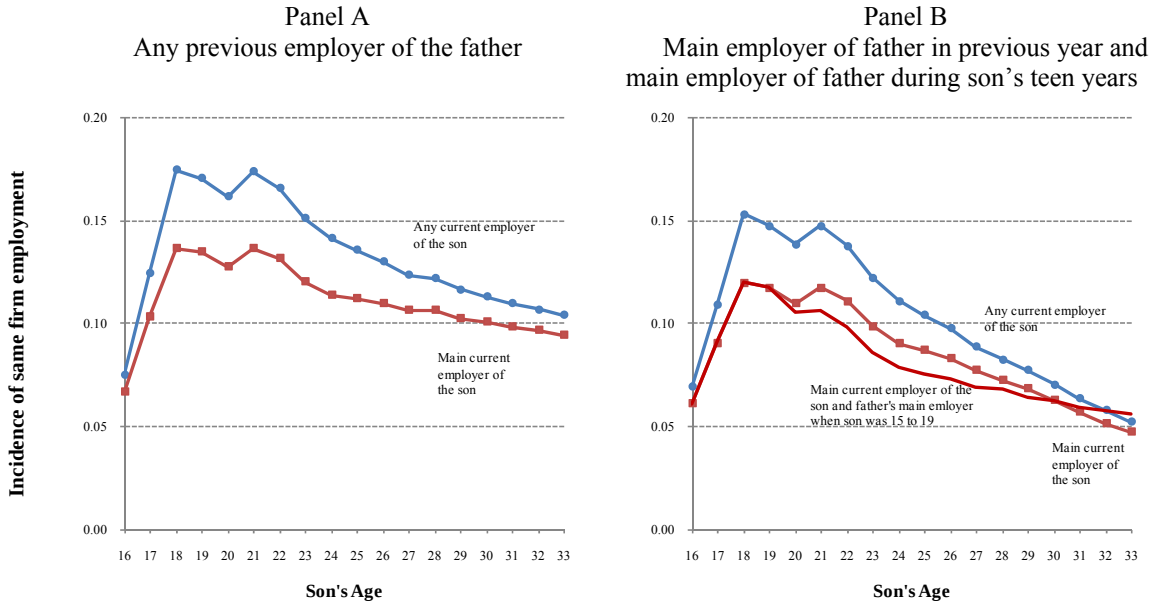
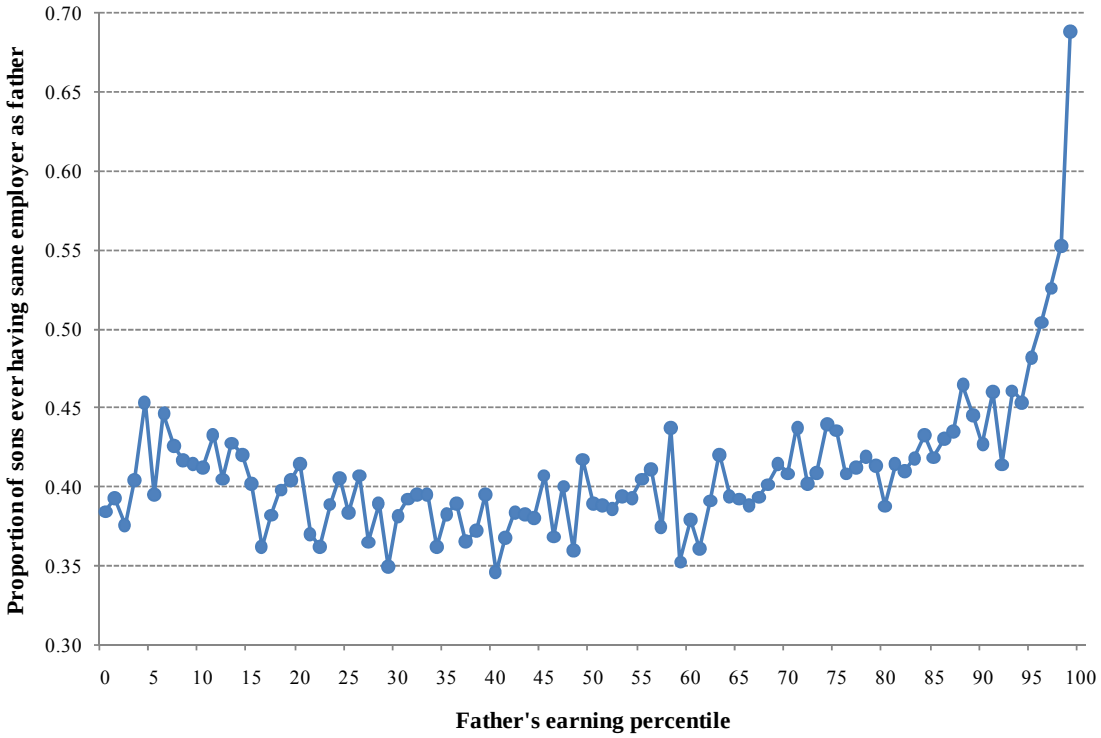
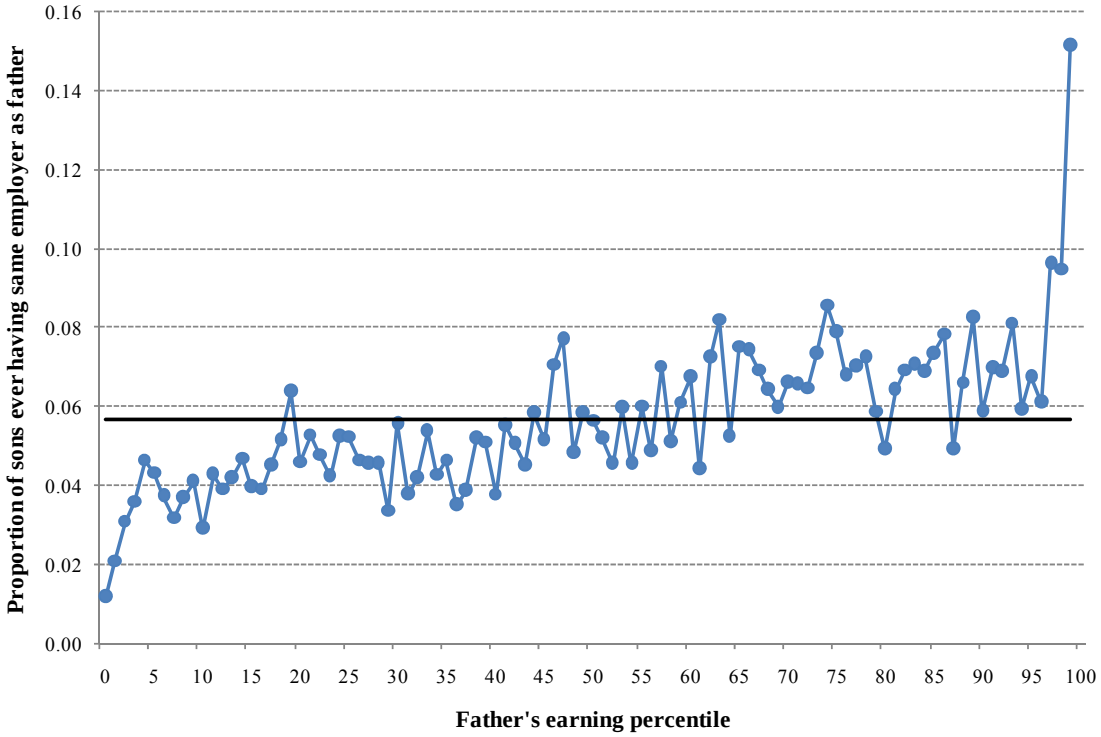


Figure 7
Proportion of sons employed currently or at some point in the past with an employer their fathers had worked for at any time in the past for each percentile of the father's earning distribution



Note: Calculations are based on weighted observations of 72,518 sons who are 33 years of age. Father's earnings percentiles are calculated using a five year average of earnings during the period sons were 15 to 19 years of age. On average fathers are 43.7 years old at the onset of this period.

Figure 8
Proportion of sons with the same main employer as their father for each percentile of the father's earning distribution: father's main employer when son was 15 to 19 years compared to sons main employer at age 33



Note: The horizontal line is drawn at 0.0566, the incidence of same firm employment for the entire sample. Calculations are based on weighted observations of 72,518 sons who are 33 years of age. Father's earnings percentiles are calculated using a five year average of earnings during the period sons were 15 to 19 years of age. On average fathers are 43.7 years old at the onset of this period.

Table 1
Descriptive statistics for fathers and sons linked intergenerational

	Number of observations	Average Age		Average Earnings		Number of unique employers	
		Fathers (1980)	Sons (1996)	Fathers	Sons	Fathers	Sons
1. All age cohorts	236,490	45.71 (6.41)	31.65 (1.10)	43,039 (29,011)	34,349 (23,127)	59,423	78,087
2. Oldest age cohort	71,269	47.34 (6.17)	33 (0.00)	43,511 (27,081)	36,129 (22,953)	24,012	31,746

Note: Panel 1 refers to all inter-generationally linked sons born between 1963 and 1966. Panel 2 refers only to those born in 1963, and who are hence 33 years of age in 1996. Fathers' earnings are averaged over the five years the son was 15 to 19 years of age, and sons' earnings are averaged between 1994 and 1996. All monetary figures are expressed as constant 1992 dollars. The number of unique employers refers only to the main employer, the employer that paid the largest proportion of total earnings during the above periods. Figures in parentheses are standard deviations.

Table 2
Intergenerational earnings elasticities from least squares estimation of a linear regression to the mean model of intergenerational mobility

	Entire sample	Public service same firm missing
1. Pooled sample		
a. All age cohorts	0.226	0.226
b. Oldest age cohort	0.250	0.250
2. Sample separation by ever same firm		
a. All age cohorts		
Never had same employer	0.168	0.173
Had same employer at some point	0.282	0.285
b. Oldest age cohort		
Never had same employer	0.190	0.197
Had same employer at some point	0.309	0.310
3. Sample separation by same main firm		
a. All age cohorts		
Never had same employer	0.207	0.207
Had same employer at some point	0.394	0.409
b. Oldest age cohort		
Never had same employer	0.233	0.233
Had same employer at some point	0.405	0.413

Note: Table entries are least squares coefficient estimates based upon a linear regression to the mean model with the natural logarithm of son's earnings averaged over three years (1994 to 1996) as the dependent variable, and the natural logarithm of the five year average of father's earnings during the years the son was 15 to 19 years of age. The model also controls for the age and age squared of both the father and the son when appropriate. All estimates are statistically significant with t statistics all above 20. Sample sizes vary from a low of 4,267 to a high of 236,490.

The sample based on "public service same firm missing" refers to a subset of the entire sample in which father-son pairs whose "matching" employer is the federal or the provincial public service are omitted.

Table 3
Descriptive information on variables used in modeling the incidence of intergenerational transmission of employers for a cohort of 33 year old men

	Variable definition and description	Mean	Standard Deviation
Dependent Variable			
Same Firm	0-1 indicator of whether the son had by the age of 33 employment in any given year since the age of 16 with a firm that employed his father in any previous year	0.410	
Father's Characteristics			
ln earnings ln earnings^2	Natural logarithm of 5 year average of father's earnings when the son was 15 to 19 years of age, and its value squared	10.6	0.514
Number of employers Number of employers^2	The number of different employers the father had over the ten year period 1978 to 1988, and its value squared	2.83	2.87
Farming income	Presence of non zero income from farming at least once over a five year period	0.0573	
Fishing income	Presence of non zero income from fishing at least once over a five year period	0.00437	
Professional income	Presence of non zero professional income at least once over a five year period	0.0156	
Self employment income	Presence of non zero income from other sources of self-employment over a five year period	0.112	
Age Age^2	Average age during the years the son was 15 to 19 years old, and its value squared	47.3	6.17
Firm and industry characteristics			
Province / Region	A series of 18 indicator variables of the region of father's residence derived from the first digit of the postal code. These are provinces with the exception of Ontario which is divided into 5 sub-provincial regions and Quebec which is divided into three. Metropolitan Toronto serves as the omitted category in the estimations.		
Urban	A 0-1 indicator of whether the father lived in an urban area as indicated by a non-zero value for the second digit of the postal code	0.730	
Firm Death	An indicator of whether the father's main employer when the son was 15 to 19 employed at least one person 30 to 33 years of age between 1994 and 1996	0.423	

Firm Size 1 to 20 Firm Size 21 to 50 Firm Size 51 to 100 Firm Size 101 to 500 Firm Size 501 and more	Indicator variables of the total number of employees of the father's main employer during the years the son was 15 to 19 years of age. The largest category serving as the reference in the estimation.	0.568 0.103 0.0703 0.142 0.117	
Industry employment growth	Difference between the natural logarithms of the total employment in the 2-digit industry of the fathers main employer in the1981 and 1996 Census of population	0.0584	0.199
Average years of schooling by two digit industry	Average years of schooling of all employees in the 2 digit SIC 1980 industry of the fathers main employer in the 1996 Census of population	12.3	1.25
Two digit industry indicators	A series of 75 indicator variables for the 2-digit SIC 1980 industry of the father's main firm when the son was 15 to 19 years old		
Interactions			
ln earnings × years industry average schooling			

Table 4
Estimates of linear probability models for same firm employment by fathers and sons: oldest cohort

	(1)	(2)	(3)	(4)	(5)
Father's Characteristics					
ln earnings	**0.0369**	**-1.14**	**-0.968**	**-0.700**	**-0.534**
ln earnings^2		**0.0566**	**0.0488**	**0.0480**	**0.0452**
Number of employers			**0.0189**	**0.00633**	**0.00710**
Number of employers^2			**-0.000849**	**-0.000469**	**-0.000465**
Farming income			0.00993	-0.0156	-0.0156
Fishing income			0.00464	0.0332	0.0361
Professional income			**-0.0829**	-0.00570	-0.0147
Self employment income			**0.0593**	**0.0476**	**0.0492**
Age	**0.00923**	**0.00954**	**0.00987**	**0.0105**	**0.0118**
Age^2 / 10	**0.00156**	**-0.00161**	**-0.00156**	**-0.00155**	**-0.00169**
Firm and industry characteristics					
Firm Death				**-0.0444**	**-0.0521**
Firm size 1 to 20 (Firm Size greater than 500 as the reference)				**0.230**	**0.0648**
Firm size 21 to 50				**0.179**	0.00139
Firm size 51 to 100				**0.163**	-0.00960
Firm size 101 to 500				**0.0989**	**-0.0372**
Industry employment growth				**0.142**	**0.170**
Average years of schooling by two digit industry				**0.113**	**0.231**
Urban				**-0.0602**	**-0.0571**
Province / Region				included	included
Two digit industry indicators					included
Interactions					
ln earnings × years industry average schooling				**-0.0169**	**-0.0254**
Constant	-0.0613	**6.07**	**5.02**	**2.96**	**1.47**
R^2	0.0078	0.0115	0.0159	0.0767	0.0989
% correctly predicted					
% same firm correctly predicted					
% no same firm correctly predicted					

Note: The dependent variable is defined to be a 0-1 indicator with the value of 1 indicating that the son was at employed at some point since the age of 16 with a firm that at some point in the past also employed his father. The analysis is based upon 71,023 33 year old men, and information on their fathers. **Boldface** indicates results with t-statistics above 1.96, the analysis being based upon sample weights and robust calculations of standard errors.

Table 5
Estimates of intergenerational earnings elasticities: least squares and maximum likelihood estimates of endogenous switching regression model

	Least Squares		Maximum Likelihood		
	(1)	(2)	(3)	(4)	(5)
1. No same firm regime					
ln earnings			**0.199**	**0.200**	**0.201**
Age			0.00151	0.00158	0.00181
Age^2 / 10			0.000261	0.000135	-0.000235
Constant			**8.11**	**8.09**	**8.09**
2. Same firm regime					
ln earnings			**0.313**	**0.300**	**0.295**
Age			0.109	0.00831	0.00749
Age^2 / 10			-0.00943	-0.00544	-0.00421
Constant			**6.69**	**6.97**	**7.06**
3. Switching equation					
ln earnings			**-2.80**	**-2.28**	**-1.87**
ln $earnings^2$			**0.140**	**0.151**	**0.147**
Number of employers			**0.0503**	**0.0162**	**0.0201**
Number of $employers^2$			**-0.00227**	**-0.00131**	**-0.00140**
Farming income			0.0265	-0.0268	-0.0288
Fishing income			0.0193	0.080	0.0964
Professional income			**-0.182**	0.00579	-0.0241
Self employment income			**0.142**	**0.126**	**0.137**
Age			**0.0313**	**0.0337**	**0.0374**
Age^2 / 10			**-0.0465**	**-0.0478**	**-0.00525**
Firm Death				**-0.119**	**-0.145**
Firm size 1 to 20	Firm Size			**0.700**	**0.175**
Firm size 21 to 50	greater than			**0.561**	0.00364
Firm size 51 to 100	500 as the			**0.525**	-0.0225
Firm size 101 to 500	reference			**0.358**	**-0.0879**
Industry employment growth				**0.431**	**0.483**
Average years of schooling by two digit industry				**0.354**	**0.740**
Urban				**-0.153**	**-0.150**
Province / Region				included	included
Two digit industry indicators					included
ln earnings × years industry average schooling				**-0.0507**	**-0.0765**
Constant			**13.1**	**8.26**	**3.87**

σ_0	**0.570**	**0.569**	**0.569**
σ_1	**0.573**	**0.570**	**0.573**
ρ_0	**-0.131**	**-0.127**	**-0.101**
ρ_1	**0.145**	-0.0807	**-0.147**
log likelihood	-108 077	-105 739	-104 737
LR test of independent equations chi2 (2)	**24.12**	**28.88**	**28.93**

Note: The analysis is based upon 71,023 33 year old men, and information on their fathers. **Boldface** indicates results with t-statistics above 1.96. Columns 3, 4, 5 report maximum likelihood estimates of an endogenous switching regression model under the assumption the error terms are distributed as tri-variate normal. The maximum likelihood algorithm uses $ln\ \sigma_i$ and $atanh\ \rho_i = 0.5\ ln\ ((1+\rho_i)/(1-\rho_i))$ for i=0,1. The marginal significance level for the null hypothesis that ρ_1=0 in model 4 is 0.097.

Appendix Table A1
Sample sizes associated with the creation of the analytical files from the Intergenerational Income Data

	Sample size	Weighted sample size
Entire sample, all male cohorts	1,890,923	2,474,667
1963 to 1966 male cohorts	653,959	886,099
Fathers with positive earnings in each of five years when sons were 15 to 19 years of age	340,199	417,510
Sons with positive earnings in each of three years between 1994 and 1996	240,478	294,706
Bottom percentile fathers deleted	238,658	291,758
Bottom percentile sons deleted	236,490	288,964
Only 1963 cohort, those 33 years of age in 1996	71,269	84,410
Analytical file for estimation containing only observations with non-missing information on all variables presented in Table 3	71,023	84,094