# The returns to entrepreneurship: selection, non-pecuniary benefits, and necessity in Mexico*

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**Abstract**

We use detailed micro-enterprise surveys in Mexico to estimate monetary and full returns—relative to wage work—for self-reported voluntary and necessity entrepreneurs, controlling for unobservables and heterogeneity in tastes and skills. Unique data on reservation wages allows us to measure the monetary value of non-pecuniary benefits. We find strong evidence of necessity only among medium and high skill entrepreneurs without employees, and only relative to formal wage work. Non-pecuniary benefits seem more substantial for those without employees, relative to employers. Our results suggest that standard definitions of necessity are misleading, and provide a more disciplined, policy-relevant way of identifying necessity.

JEL classification: C21, J24, J31

Keywords: Talent misallocation, necessity entrepreneurship, non-pecuniary benefits of entrepreneurship, generalized Roy model, occupational choice, earnings differentials, reservation wage.

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# 1 Introduction

We study the allocation of talent in Mexico across wage work and entrepreneurship, and ask whether micro entrepreneurs would earn more if they worked for someone else for a wage instead of running their firm. Is the assignment of talent across occupations optimal? Does necessity entrepreneurship exist? What does necessity in the occupational choice mean? Guided by these questions, we analyze detailed micro-enterprise surveys in Mexico. Our results suggest that standard definitions of necessity are misleading, and provide a more structured, disciplined way to identify necessity that has relevant policy implications.

Our empirical strategy aims to estimate the monetary and full—monetary plus non-pecuniary—returns to entrepreneurship, controlling for unobservables, and taking into account heterogeneity in skills and tastes. To this end, we apply the generalized Roy model to pooled cross-sections of full-time, full-year male workers aged 25-49, for the years 2008, 2010, and 2012. The dataset contains information on the stock of capital of the firm, detailed questions on the reasons for starting a business, and—more interestingly—the salary that would induce the entrepreneur to leave his business. We use the information on the value of the capital stock to create a measure of entrepreneurial earnings that is comparable to wage earnings. Further, this measure implicitly captures the idiosyncratic excess returns to capital over a risk-free alternative, consistent with the work of McKenzie and Woodruff (2006), and Falco and Haywood (2016). We then use the reservation wage of the entrepreneurs to explicitly incorporate in the estimation the non-pecuniary benefits of running a business, not only in the selection equation, but also as an outcome. To our knowledge, this is the first study that exploits reservation wages to estimate the full returns to entrepreneurship.

We then compute the monetary treatment-on-the-treated (MTT), and the full treatment-on-the-treated (FTT). The latter includes the monetary value of the non-pecuniary benefits of entrepreneurship relative to wage work. We compare the monetary return to the full return to study the importance of non-pecuniary benefits and necessity in the occupational choice: a negative MTT but a positive FTT would suggest that non-pecuniary benefits are the main driver of selection into entrepreneurship; if both MTT and FTT are positive, then we would conclude that both monetary rewards and non-pecuniary rewards are significant; a negative FTT would indicate an involuntary entry—or entrepreneurship out of necessity. We run the model separately for self-reported voluntary and necessity entrepreneurs.

In general, we find no evidence of necessity entrepreneurship: monetary and full returns are large and positive across major sectors, age, and schooling levels—regardless of the reported reason for starting a business. However, we find strong evidence of necessity relative to formal wage work among medium and high skill entrepreneurs without employees. These individuals experience negative monetary and full returns, whether they identify themselves as necessity entrepreneurs or not. We also find that non-pecuniary benefits—the difference between the monetary and full returns—are always positive, but seem to be larger for non-employers relative to employers, regardless of the self-reported nature of entrepreneurship. Larger non-pecuniary benefits for those working alone compared to those with employees suggests that some of the subjective benefits of business ownership dissipate with the additional effort required to manage others.

The literature on the returns to entrepreneurship can be divided into two streams: understanding

the role of non-pecuniary benefits in entrepreneurial choice, and identifying the differences between necessity and "opportunity" entrepreneurs. On the first category, Hurst and Pugsley (2011) report that non-pecuniary benefits seem to be a first-order determinant of entry into entrepreneurship among small business owners in the US. Using a model of occupational choice with heterogeneous wealth levels and tastes for entrepreneurship, Hurst and Pugsley (2015) find entrepreneurship to be a normal good with respect to wealth, and that non-pecuniary entrepreneurs choose a small scale for their business. Hamilton (2000) examines earnings differentials between self-employment and paid employment in the U.S. and finds that most entrepreneurs enter and persist in business despite having both lower initial earnings and lower earnings growth than in paid employment. He concludes that entrepreneurship does not pay and that the non-pecuniary benefits of self-employment must then be substantial. Tergiman (2010) estimates a life-cycle model of occupational choice and finds that the earnings differential documented by Hamilton (2000) is in fact U-shaped, with entrepreneurs earning more than wage workers both early and late in their lives. She finds that the lifetime returns to entrepreneurship are identical to those of being a paid employee. Levine and Rubinstein (2016) disagreggate the self-employed into incorporated and unincorporated to distinguish entrepreneurs from other business owners. They find that incorporated business owners tend to be white males from higher-income families, and— as teenagers—exhibited both higher ability and proclivity for illicit activities. This combination of ability and attitude towards risk accounts for entry into entrepreneurship, as well as much higher hourly earnings compared to wage workers and unincorporated business owners.

The second stream of the literature focuses on opportunity and necessity as the two major distinct motivations for starting a business. Opportunity entrepreneurs are described as those who identify and take advantage of a good business prospect, instead of working for someone else for a wage. Necessity entrepreneurs, on the other hand, start their own business after they have failed to find wage work. Faggio and Silva (2014) study rural and urban labor markets in Britain, and find that "genuine" entrepreneurship—as measured by business creation and innovation—is positively correlated with self-employment in urban areas, but not in rural areas, where more workers become self-employed because of poor labor market conditions. Falco and Haywood (2016) use a panel dataset for Ghana to estimate a model where returns to physical and human capital, as well as barriers to salaried work, drive selection into self-employment. They find high and increasing returns to productive characteristics in self-employment, as well as increasing skill levels among the self-employed. They interpret these findings as evidence against the necessity motivation for entrepreneurship. Calderon et al. (2016) study a large sample of female entrepreneurs in Mexico and find that, on average, opportunity entrepreneurs have higher skills and exhibit better performance than their necessity counterparts. Using microdata from the U.S. and Germany, Fairlie and Fossen (2017) distinguish necessity from opportunity motives based on the entrepreneur's prior work status, and document that opportunity entrepreneurship tends to be pro-cyclical, while necessity entrepreneurship is counter-cyclical.

The mixed evidence on the roles of necessity and opportunity motives may arise because individuals who care about the non-pecuniary benefits of business ownership could optimally choose entrepreneurship, even if the monetary returns are lower compared to wage work. In other words, the comparison between opportunity and necessity entrepreneurship needs to be defined more broadly to consider the non-pecuniary benefits of running a business. Our data include detailed questions on the motives for

starting a business, as well as the previous employment status of the individual, which allows for an *a priori* distinction between necessity and voluntary entrepreneurship that is consistent with previous empirical and theoretical work. The current literature would treat anybody with negative monetary returns as either a necessity entrepreneur, or as someone who surely must attach a high-enough subjective value to owning a business. Our empirical strategy provides a structured way to identify necessity *a posteriori*—based on our estimated monetary and full returns, without relying on the self-reported reasons for starting a business. We show that there are cases in which both monetary and full returns are negative, which would indicate true necessity. Indeed, we find evidence of necessity even among some self-reported voluntary entrepreneurs.

Our findings suggests that medium and high skill entrepreneurs who do not employ others would be considerably better off if they worked for a firm in the formal sector. The re-allocation of these individuals into the formal sector would boost aggregate productivity and welfare. Based on these findings, we recommend policies aimed at reducing the regulatory and tax burden imposed on formal employment as a complement to the more traditional development policies aimed at facilitating small startups, either through access to credit, subsidies, and/or preferential tax treatment.

## 2 The Generalized Roy Model

We use the generalized version of Roy (1951) sectoral choice model, formalized by Sattinger (1975); Willis and Rosen (1979); Heckman and Sedlacek (1985, 1990), and Heckman and Honore (1990), and applied by Gould (2002) and Mulligan and Rubinstein (2008), among many others. More recently, Eisenhauer et al. (2015) develop conditions that make it possible to identify non-parametrically the full return to participating in a program (in our context, the full return to entrepreneurship over wage work). Unlike them, we do observe the subjective costs and benefits of participation via the self-reported reservation wages.

In the Roy model, heterogeneous individuals choose occupations according to their abilities and preferences. Each person is endowed with a different vector of skills and characteristics such as coordination, organization, negotiation, communication and managerial skills, initiative, attitudes towards risk, self-discipline, a taste for a flexible work schedule, a taste for independence, an aversion to complying with someone else's orders, a preference for the possibility of delegating unwanted tasks. These characteristics are non-separable in the sense that workers cannot use them individually at different occupations. At the same time, these vectors of characteristics are not equally productive in all occupations. Presumably, entrepreneurship requires better managerial skills and more initiative than wage work, while wage work requires a lower aversion to complying with someone elseś orders than entrepreneurship. In particular, there is a task function that maps the skills and attributes of individuals into their level of occupation-specific ability. Abilities in turn determine earnings, and agents consider potential labor earnings and their tastes and preferences when deciding on an occupation.

More specifically, following Heckman and Honore (1990) and Gould (2002), let $t_{1i}$ denote the level of $i$'s ability at entrepreneurship and $t_{0i}$ his ability at wage work. The occupation-specific ability prices, which are determined competitively in the market, are $\pi_1$ and $\pi_0$. Let $y_{1i} \equiv \pi_1 t_{1i}$ denote $i$'s monetary reward from running a business, and $y_{0i} \equiv \pi_0 t_{0i}$ denote his monetary reward if he decides to work for a

wage. In other words, $y_{1i}$ and $y_{0i}$ are agent $i$'s potential earnings in entrepreneurship and wage work.

We assume, without loss of generality, that working for a wage involves no other reward for the worker but his monetary earnings. Entrepreneurship, on the other hand, might involve non-pecuniary benefits—such as a flexible work schedule—and costs—such as more risk. Let $B_i$ denote individual $i$'s monetary value of the net subjective benefits associated with running a business. The full reward for $i$ if he enters entrepreneurship is $\pi_1 t_{1i} e^{B_i}$. The full reward of entrepreneurship then considers not only the monetary reward but also the monetary value of the non-pecuniary benefits and costs of entering the sector. Thus if $B_i > 0$ the worker perceives entrepreneurship as more subjectively beneficial than working for a wage; if $B_i < 0$ then the worker perceives entrepreneurship as more subjectively costly than working for someone else; $B_i = 0$ indicates that the worker considers only the monetary rewards when choosing an occupation.

It follows then that $i$ will work as an entrepreneur if

$$y_{1i} e^{B_i} \geq y_{0i}$$

If the reverse holds, then $i$ will work for someone else. Log-abilities and tastes are normally distributed:

$$\begin{pmatrix} \ln t_0 \\ \ln t_1 \\ B \end{pmatrix} \sim N \left( \begin{pmatrix} \mu_0 \\ \mu_1 \\ \mu_B \end{pmatrix}, \Sigma \right),$$

with

$$\Sigma \equiv \begin{pmatrix} \sigma_{00} & \sigma_{01} & \sigma_{0B} \\ \sigma_{01} & \sigma_{11} & \sigma_{1B} \\ \sigma_{0B} & \sigma_{1B} & \sigma_{BB} \end{pmatrix}.$$

Thus, log-earnings and benefits can be written as

$$\begin{aligned} \ln y_0 &= \ln \pi_0 + \mu_0 + U_0, \\ \ln y_1 &= \ln \pi_1 + \mu_1 + U_1, \\ B &= \mu_B + U_B, \end{aligned}$$

where

$$\begin{pmatrix} U_0 \\ U_1 \\ U_B \end{pmatrix} \sim N(0, \Sigma).$$

Let $\ln y_0 \equiv Y_0$ and $\ln y_1 \equiv Y_1$. Further, let $D_i$ denote $i$'s occupational choice:

$$D_i = \begin{cases} 1 & \text{if } i \text{ works as an entrepreneur} \\ 0 & \text{if } i \text{ works for a wage} \end{cases}$$

Thus, $D_i = 1$ if $Y_{1i} + B_i \geq Y_{0i}$.

Demographic characteristics in the model affect the rewards—both the monetary payment and the full reward in the case of entrepreneurs–linearly:

$$\begin{aligned} Y_{0i} &= X_i\beta_0 + W_i\gamma_0 + U_{0i}, & (1) \\ Y_{1i} &= X_i\beta_1 + W_i\gamma_1 + U_{1i}, & (2) \\ B_i &= X_i\beta_B + T_i\alpha + U_{Bi}, & (3) \end{aligned}$$

where $X$ are demographic characteristics that affect both market earnings and the non-pecuniary benefits from entrepreneurship, $W$ are demographic characteristics that affect only market earnings, and $T$ are the exclusion restrictions, that is, additional demographic characteristics affecting only the non-pecuniary benefits of running a business, and therefore the selection equation, but not the monetary outcomes. With these functional forms, we have that $D_i = 1$, conditional on $X$, $W$, and $T$, if (omitting the $i$ subscript)

$$U_1 + U_B - U_0 \geq -\left[X\left(\beta_1 + \beta_B - \beta_0\right) + W\left(\gamma_1 - \gamma_0\right) + T\alpha\right].$$

In the data we observe $y_{1i}$ and $y_{1i}e^{B_i}$ only for those who chose to run a business, and $y_{0i}$ only for those who chose to work for a wage. The sample of workers in each occupation is therefore non-random–we observe $Y_{0i}$ if $Y_{0i} > Y_{1i} + B_i$, and both $Y_{1i}$ and $Y_{1i} + B_i$ if $Y_{0i} \leq Y_{1i} + B_i$. To estimate the parameters of the model and compute the MTT, as well as the FTT, we apply the standard selection correction procedure in Heckman (1979).

In the Roy model there is no such thing as the return to entrepreneurship but rather a distribution of returns in the population, and the MTT (FTT) indicates the average additional earnings (earnings plus the value of non-pecuniary benefits) that those who choose entrepreneurship receive relative to working for a wage, or in other words, the additional reward from switching from working for a wage to running a business for those who actually switched. Note that in this framework, a negative MTT but a positive FTT would indicate that non-pecuniary benefits are the main driver of selection into business ownership; if both MTT and FTT are positive, then we would conclude that both monetary rewards and non-pecuniary rewards explain the occupational decision; a negative FTT would indicate an involuntary entry into the entrepreneurial sector, that is, entrepreneurship out of necessity.

Let and $\phi$ and $\Phi$ denote the density and cumulative distribution function for the standard normal distribution, and define

$$Z \equiv (X, W, T),$$

$$U_V \equiv U_1 + U_B - U_0,$$

$$\theta \equiv (\beta_1 + \beta_B - \beta_0, \gamma_1 - \gamma_0, \alpha).$$

Define

$$\lambda(\kappa) \equiv \frac{\phi(\kappa)}{\Phi(\kappa)}$$

which is known as the inverse Mill's ratio—a nonnegative and declining function of $\kappa$. Note that

$$\Pr(D=1 \mid Z) = \Pr(Y_1 + B > Y_0 \mid Z) = \Phi\left(\frac{Z\theta}{\text{sd}(U_V)}\right), \tag{4}$$

where sd $(U_V)$ refers to the standard deviation of $U_V$. The first step is to estimate this standard Probit equation of $D$ on $Z$ and obtain values for $\theta/\text{sd}_{(U_V)}$. Using these estimates, we construct $\lambda(\widehat{\kappa})$ for each individual.

The expected log earnings observed in each occupation, and the expected full subjective reward observed for the entrepreneurs equal their respective unconditional means plus a sample selection correction term:

$$\text{E}(Y_0 \mid D=0, Z) = X\beta_0 + W\gamma_0 - \frac{\text{cov}(U_0, U_V)}{\text{sd}(U_V)}\left[\frac{\phi\left(-\frac{Z\theta}{\text{sd}(U_V)}\right)}{\Phi\left(-\frac{Z\theta}{\text{sd}(U_V)}\right)}\right], \tag{5}$$

$$\text{E}(Y_1 \mid D=1, Z) = X\beta_1 + W\gamma_1 + \frac{\text{cov}(U_1, U_V)}{\text{sd}(U_V)}\left[\frac{\phi\left(\frac{Z\theta}{\text{sd}(U_V)}\right)}{\Phi\left(\frac{Z\theta}{\text{sd}(U_V)}\right)}\right], \tag{6}$$

$$E(B \mid D=1, Z) = X\beta_B + T\alpha + \frac{\text{cov}(U_B, U_V)}{\text{sd}(U_V)}\frac{\phi\left(\frac{Z\theta}{\text{sd}(U_V)}\right)}{\Phi\left(\frac{Z\theta}{\text{sd}(U_V)}\right)}. \tag{7}$$

The second step is to estimate equations (5), (6), and (7) by ordinary least squares (OLS). With the outcome means we can compute treatment effects. The average MTT and FTT are

$$\begin{aligned} MTT(z) &= \text{E}(Y_1 - Y_0 \mid D=1, Z=z) \\ &= X(\beta_1 - \beta_0) + W(\gamma_1 - \gamma_0) + \frac{\text{cov}(U_1 - U_0, U_V)}{\text{sd}(U_V)}\frac{\phi\left(\frac{Z\theta}{\text{sd}(U_V)}\right)}{\Phi\left(\frac{Z\theta}{\text{sd}(U_V)}\right)}, \end{aligned} \tag{8}$$

$$
\begin{aligned}
FTT(z) &= \mathrm{E}(Y_1 + B - Y_0 \mid D = 1, Z = z) \\
&= X(\beta_1 + \beta_B - \beta_0) + W(\gamma_1 - \gamma_0) + T\alpha + \mathrm{sd}(U_V) \frac{\phi\left(\frac{Z\theta}{\mathrm{sd}(U_V)}\right)}{\Phi\left(\frac{Z\theta}{\mathrm{sd}(U_V)}\right)}. \qquad (9)
\end{aligned}
$$

The demographics $X$ affecting the three outcome equations are age and age squared (as is standard in wage regressions), location dummies (whether the worker is from the north, the center, or the south of the country, and whether he is from a large urban area), and year fixed effects for each cross section in our sample. The demographics $W$, which affect only the earnings equations, are dummies for years of schooling and sector dummies. We assume then that schooling and sector affect the monetary but not the full compensation that workers require to switch from working for a wage to entrepreneurship. The exclusion restrictions are an indicator for whether the worker is married, and an indicator for whether the worker is the household head and has children less than 18 years of age.[1] The underlying assumption is that workers who are married and have children are more likely to prefer the stability of paid work, as opposed to the risks of entrepreneurship, which would imply a lower full compensation to accept a job working for someone else.

## 3 Data and estimation strategy

We use data for male workers from Mexico's *Encuesta Nacional de Ocupación y Empleo* (National Occupation and Employment Survey, ENOE) and *Encuesta Nacional de Micronegocios* (National Microbusinesses Survey, ENAMIN) for the fourth quarter of the years 2008, 2010, and 2012. The *Instituto Nacional de Estadística, Geografía e Informática* (National Institute for Statistics, Geography, and Computing, INEGI) administers both surveys and the data is available online without restrictions.

The ENOE is a cross-section of households representative of the Mexican labor market in which workers are observed at most five times over a five-quarter period. The ENAMIN applies a thorough questionnaire on the operations of the firm to a sub-sample of self-reported micro business owners from the ENOE. INEGI defines a micro business as a business which employs up to four workers, and up to 15 in the case of manufacturing. Unlike the ENOE, the ENAMIN has been applied sporadically—every two years from 1992 to 1998, in 2002, and the fourth quarter of 2008, 2010 and 2012. [2]

We restrict our sample to males of ages 25 to 49 in urban areas—with at least 15,000 residents—employed in the private sector—specifically in manufacturing, construction, retail and wholesale, and the service sector. We focus on full-time, full-year workers (working between 32.5 and 126 hours per week the complete 12 months each year), who report not having searched for another job. We further exclude workers still in school or with a graduate degree, those with a secondary occupation, unpaid workers, workers in the primary sector, as well as government employees. We trim the top and bottom

[1] In the data we can determine whether the worker has children only when he is the household head.

[2] Around 90% of business owners in Mexico run a micro firm, but presumably our analysis excludes the right tail of the entrepreneurial talent distribution. Nonetheless, the inclusion of these entrepreneurs would only increase the size of the estimated returns.

1% of the earnings distribution in each occupation. In the analysis, an employee is an individual who works for someone else, whereas an entrepreneur is an individual who works on his own or runs his own business, either without employees or hiring other workers. Our final sample size consists of 69,541 individuals: 58,531 wage workers and 11,010 entrepreneurs, half of the latter operating without employees.

In our sample, business owners are slightly older than wage workers, as shown in Figure 1: the average micro business owner is 39, whereas the average wage worker is 35.5. Figure 2 shows that business owners are significantly more likely to work in Wholesale & retail and Services than wage workers, whereas wage workers are more likely to work in Manufacturing than business owners. Business owners, however, do not significantly differ from wage workers in their educational attainment, as seen in Figure 3.

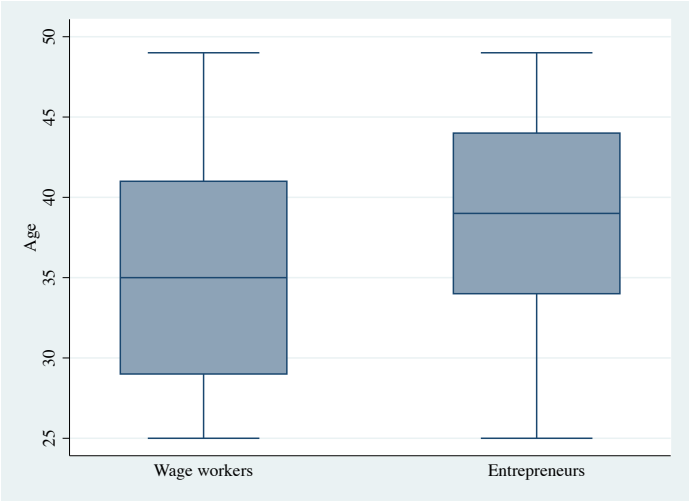



Figure 1: Distribution of workers in each occupation by age (percentiles 25th, 50th, and 75th).

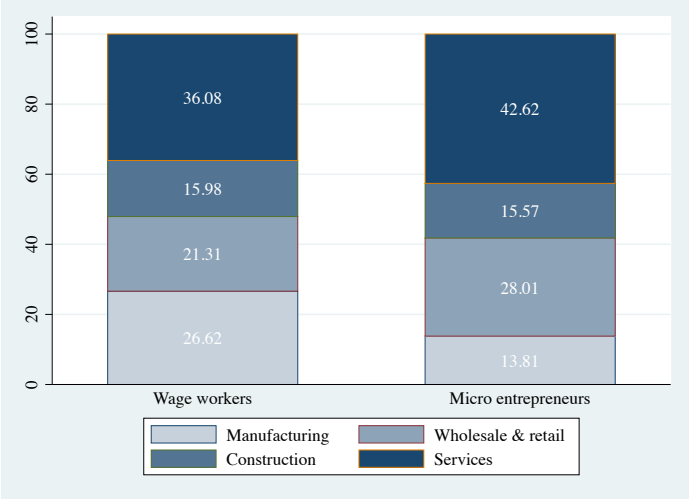



Figure 2: Distribution of workers in each occupation across sectors.

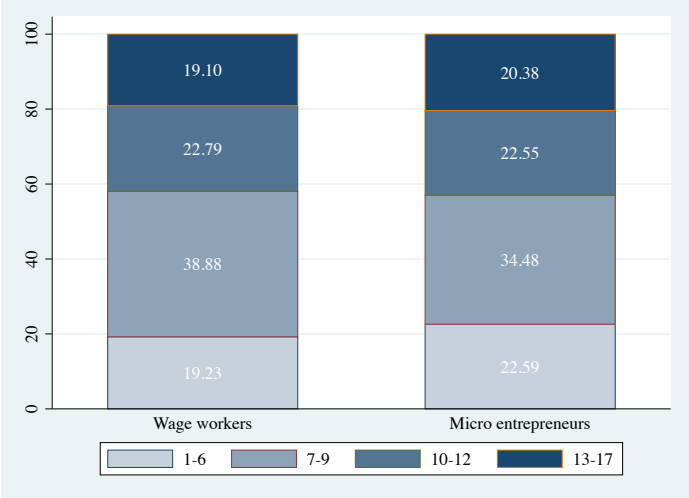



Figure 3: Distribution of workers in each occupation across years of schooling.

Figure 4 shows the distribution of entrepreneurs in our sample by the age of their firm. Entrepreneurship in our sample is a relatively permanent occupation: the median business is 8 years old, and only 10% of the businesses had been operating for one year or less before they were surveyed.

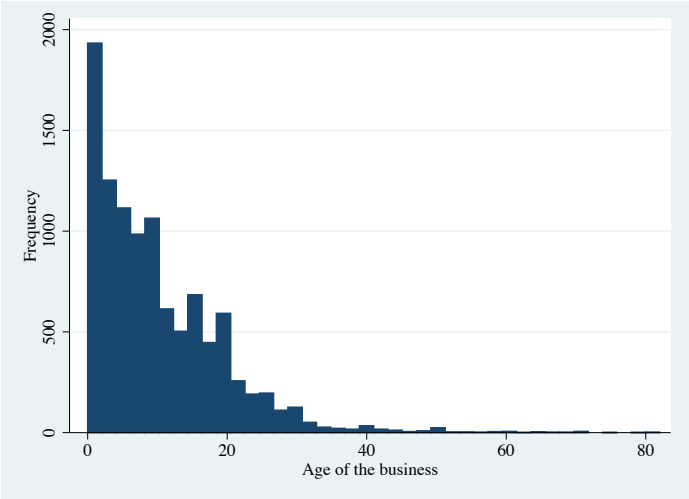



Figure 4: Distribution of micro firms by age.

### 3.1 Self-reported necessity entrepreneurs

The ENAMIN surveys entrepreneurs about their occupation three months before starting their firm, about the reason they left their previous job—if they were employed—and about their reasons for starting their business. We consider an entrepreneur as out of necessity—according to him—if one of the following is true:

- The worker was unemployed and searching for another job the three months before he started the business.
- The worker was a paid or unpaid employee the three months before he started the business and left

that job because he was fired, the employer went bankrupt, the employer relocated to another city or country, because of a labor dispute or strike, or because of some disability.

- The worker reports starting the business because it was the only way to earn an income, because of lack of experience, schooling or training for another occupation, because he was overqualified for any other job, or because of lack of employment opportunities.

The first two reasons above are consistent with the definition of necessity used by Fairlie and Fossen (2017), while the last one is similar to more conventional definitions of necessity, such as the one used by the Global Entrepreneurship Monitor. In our sample, 34% of entrepreneurs without employees, and 21% of those employing others reported entering entrepreneurship out of necessity. Figure 5 shows the fraction of self-reported necessity business owners in each sector: necessity seems to be lowest in Construction, and the highest in Wholesale & retail, where necessity entrepreneurs account for nearly 40% of those working alone.

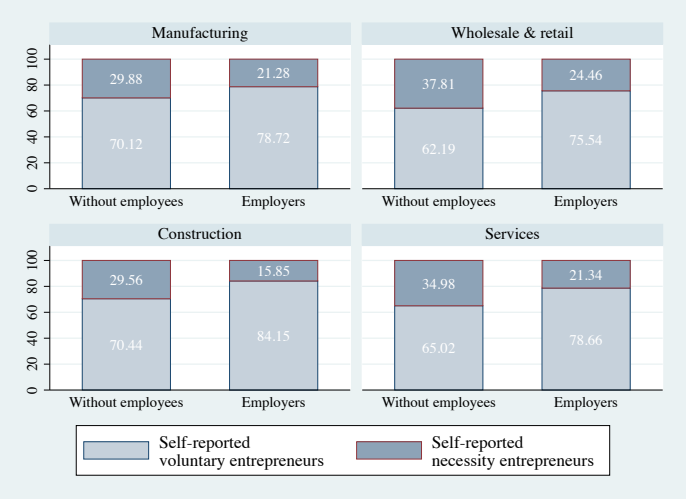



Figure 5: Fraction of self-reported necessity entrepreneurs in each sector.

The ENOE contains information only on current employment, so we cannot construct a similar indicator of necessity for the wage workers. In other words, we do not observe whether some wage workers were forced to leave their previous employment, or were overqualified for other positions, but were still able to land their current job. Note that such wage workers would be the appropriate comparison group for the self-reported necessity entrepreneurs if whether they undergo this episode depends on unobservables.

### 3.2 Profits, earnings, and the returns to capital

The ENOE is the only data source that we exploit for wage workers. The survey asks the respondent about the monthly earnings of each household member, but the respondent may or may not be the worker himself. The ENAMIN, on the other hand, directly surveys the micro entrepreneur, and the questionnaire specifically asks him about his monthly profits.[3]

[3]We observe a second measure of profits in the ENOE, and in addition, the ENAMIN asks the business owner about his monthly revenues and expenses as well, which we can subtract to compute a third measure. Although these three measures are

The reported profits by entrepreneurs contain the idiosyncratic returns to their capital stock, so we need to construct a measure of earnings for entrepreneurs that we can use as counterparts to the earnings of wage workers. Fortunately, the ENAMIN also asks the entrepreneur about the current market value of his stock of capital:

> If you were to sell the tools, machinery, furniture, equipment, land, buildings, facilities, and vehicles of your property which you employ in your trade or business, how much would you sell them for?[4]

Most businesses in our sample use at least some capital, but the median value of these assets is less than USD$850 (around MXN$17,000). Micro firms in construction are by far the least capital intensive in the data.

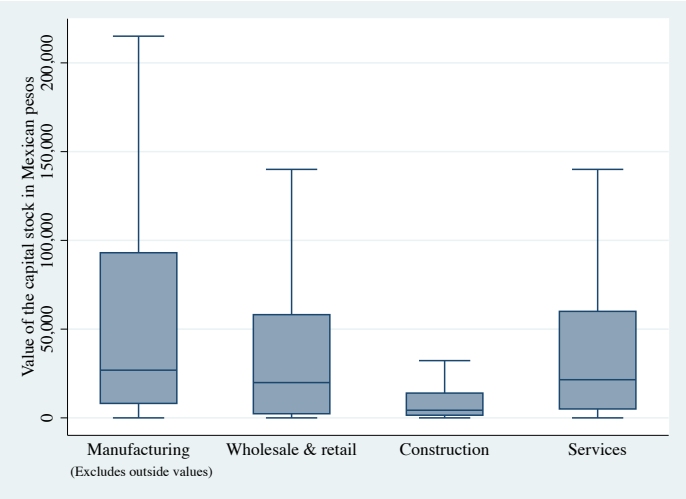



Figure 6: Distribution of the market value of the stock of capital of the firms in the sample, as reported by the business owners.

If $\pi$ denotes the business profits, $K$ the value of the stock of capital, and $q$ the risk-free rate of return, then a straightforward estimate of entrepreneurial earnings that is comparable to wage earnings is $\pi - qK$, since selling the business assets and investing the proceeds at the risk-free rate is always an investment alternative to the owner if he chooses to move into wage work. This way, we capture not only the entrepreneur's return on his effective labor, but also the excess return on the entrepreneur's capital, which is the extra capital earnings he would have to give up if he chooses to work for a wage. [5] We set $q = 7.97\%$ in 2008, $q = 4.45\%$ in 2010, and $q = 3.91\%$ in 2012, which were the average annualized returns on a 28-day government bond in Mexico. We then compute the monthly capital return for each owner as $qK/12$, and then subtract the capital return from our measure of profits. [6]

strongly correlated, they are not identical. Reported monthly profits in ENAMIN is our preferred measure of gross earnings.

[4]The question reads in Spanish "Si usted tuviera que vender las herramientas, utensilios, maquinaria, mobiliario, equipo, terreno, local y vehículos de su propiedad que utiliza en su negocio o actividad, ï¿œen cuánto los vendería?"

[5]The returns to capital are likely the result of a mixture of managerial ability, market-specific profitability, and credit constraints. McKenzie and Woodruff (2006) argue that in the case of Mexican micro enterprises, market-specific profitability is likely to play a small role. They also find a positive correlation between their measures of individual ability and their estimated returns to capital.

[6]Note that the return on entrepreneurial talent may be zero, and therefore the worker will not be included in the analysis

### 3.3 Reservation wages

The ENAMIN survey asks the entrepreneur about his reservation earnings—the earnings that would induce him to leave his business. Specifically, the question is

> What is the monthly salary which would make you leave your business or entrepreneurial activity?[7]

Presumably, in his response the owner considers only his monthly labor earnings—the entrepreneur knows he will sell his assets and take the proceeds with him if he moves into another occupation. Therefore, we do not have to deduct the estimated capital return from this measure. Moreover, the owner not only includes his monthly labor earnings but also the monetary value of the non-pecuniary benefits and costs from running a business.

Entrepreneurs in our data tend to work longer hours than wage workers, as shown in Table 1. Whereas entrepreneurs work on average around 56 hours per week , wage workers work only 52 hours. Figure 7 shows there is more dispersion in the hours of entrepreneurs, which could suggest more flexible work schedules compared to wage workers. To correct for these observed differences in hours worked, we choose to work with hourly figures.[8]

Table 1: Weekly hours

| | Mean | Median | SD |
|---|---|---|---|
| Wage workers | 52.40 | 48 | 10.67 |
| Voluntary entrepreneurs | 55.77 | 54 | 13.50 |
| Necessity entrepreneurs | 55.94 | 54 | 13.96 |
| Total | 52.94 | 48 | 11.26 |

as we work with log earnings, if the figure that the respondent reports is less than or equal to the estimated capital return. In other words, the labor earnings for the entrepreneurs cannot be strictly less than zero.

[7] In Spanish the question reads "ï¿œCuál es el salario mensual por el que usted aceptaría dejar su negocio o actividad?"

[8] The reported reservation wage is a monthly figure and, presumably, the worker includes an adjustment to his hours worked when computing the reservation earnings. Since entrepreneurs work longer hours than wage workers, not adjusting for potentially shorter hours actually underestimates our measure of hourly reservation earnings, which would tend to bias our estimates of the value of non-pecuniary benefits downwards.

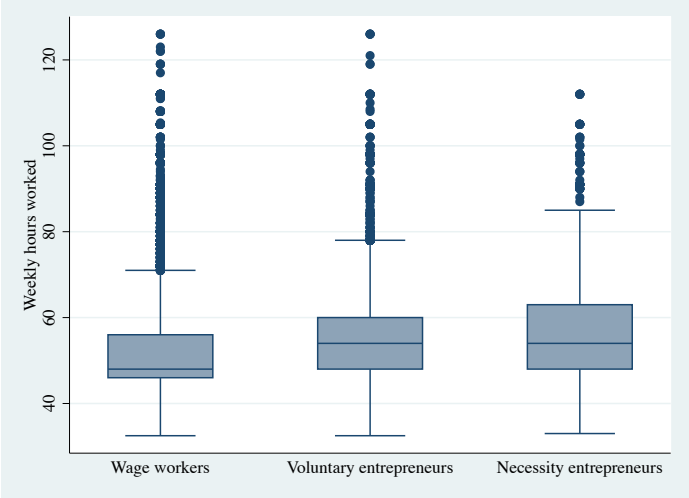



Figure 7: Distribution of hours worked per week in each occupation.

Figure 8 shows the relationship between entrepreneurial earnings and the reservation wages in our sample of entrepreneurs. Notice that there is a clear positive relationship between the entrepreneurs' earnings and their reservation wages. Figure 9 shows the distributions of earnings for wage workers and entrepreneurs, as well as the reservation wages of the latter, while Figure 10 contains the distribution of the differences between the reservation wage and entrepreneurial earnings. These figures suggest that entrepreneurship involves net non-pecuniary benefits, as reservation wages are higher than entrepreneurial earnings for most of the sample, even for the self-reported necessity entrepreneurs.

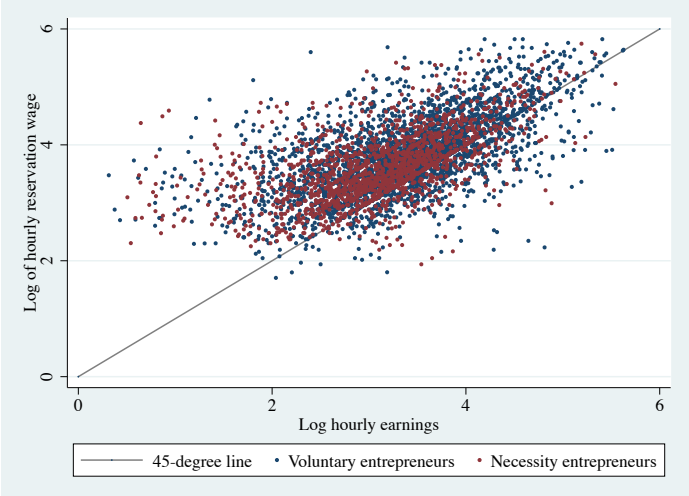



Figure 8: Earnings and reservation wages of entrepreneurs.

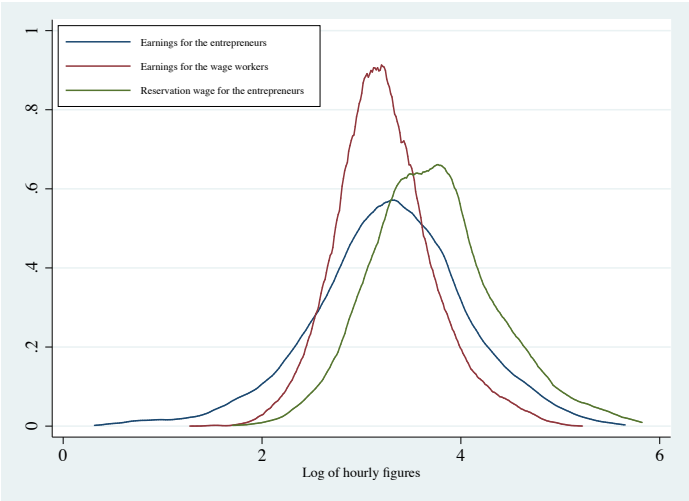



Figure 9: Densities for earnings and reservation wages.

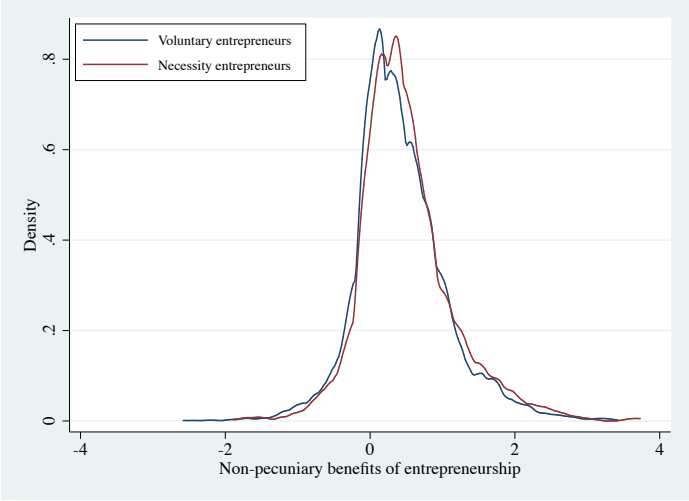



Figure 10: Distribution of non-pecuniary benefits for voluntary and necessity entrepreneurs.

# 4 Estimates of monetary and full returns

We do not pool entrepreneurs in a single sample but instead run the generalized Roy model separately for the voluntary entrepreneurs and the self-reported necessity entrepreneurs. That is, we assume that all wage workers entered voluntarily into the sector, and compare the earnings of the wage workers to the earnings of voluntary entrepreneurs and to the earnings of self-reported necessity entrepreneurs, and compute both the monetary and the full return to entrepreneurship in each case. The selection problem in the case of the self-reported necessity entrepreneurs then arises not from the occupational choice (as they argue that they were forced into the sector), but from precisely whatever unobservables that forced them out of wage work in the first place.

Our estimated returns are conditional on observable characteristics. Thus, to streamline our exposition, we focus on workers who are married, who are heads of household with children, from a large urban area (at least 100,000 residents), from the center of the country, in the year 2012. In other words,

we set all the corresponding dummy variables for these characteristics equal to 1 in our calculations of equations 8 and 9, and then present how estimated returns vary according to age, schooling, and sector. [9] We calculate returns for the entire sample, and also separately for employers and non-employers, for different skill levels, and relative to formal and informal wage work.

### 4.1 Monetary and full returns in the entire sample

We present detailed estimation results from the generalized Roy model in the Appendix. Without controlling for selection bias or the possibility of heterogeneous skills and tastes, we find that voluntary entrepreneurs earn on average 9.4% more per hour than wage workers. When we include the monetary value of non-pecuniary benefits, their hourly return increases to 50.6%. In the case of necessity entrepreneurs, the monetary returns are 8.9% lower compared to wage workers, but once we include the value of non-pecuniary benefits, these returns increase to 38%. This preliminary evidence suggests important and significant presence of non-pecuniary benefits for both types of entrepreneurs.

In Figure 11 we show how the MTT and FTT vary with age, sector, and educational attainment, separately for both the voluntary and the self-reported necessity entrepreneurs, while keeping the remaining observables fixed. Our MTT and FTT estimates, as reported in the figures, take the form $\ln(y_1/y_0)$. Hence, to recover the returns in percentage terms, we have to take the exponential of that figure and subtract 1 from it. For example, according to the top-left panel in Figure 11, a 49 year-old male in manufacturing, with 1 to 6 years of schooling, who entered entrepreneurship out of necessity, earns on average around 112% ($e^{.75} - 1$) more than if he worked for a wage. If we consider the subjective benefits of running a firm, the return rises to around 250% ($e^{1.25} - 1$).

The four panels in Figure 11 show that monetary returns and full returns to both voluntary and necessity entrepreneurship are positive and decline with age. Full returns exceed monetary returns for both types of entrepreneurs across all sectors by 35% to 170%, indicating the presence of substantial non-pecuniary benefits. Notice that self-reported necessity entrepreneurs not only earn more than if they worked for a wage, but also attach a positive subjective value to running their own business. In other words, there is no evidence that necessity entrepreneurship exists on average.

[9] Estimates for the counterparts—e.g. single men, from the north, in the year 2010—are available upon request and can be easily calculated using our STATA code.

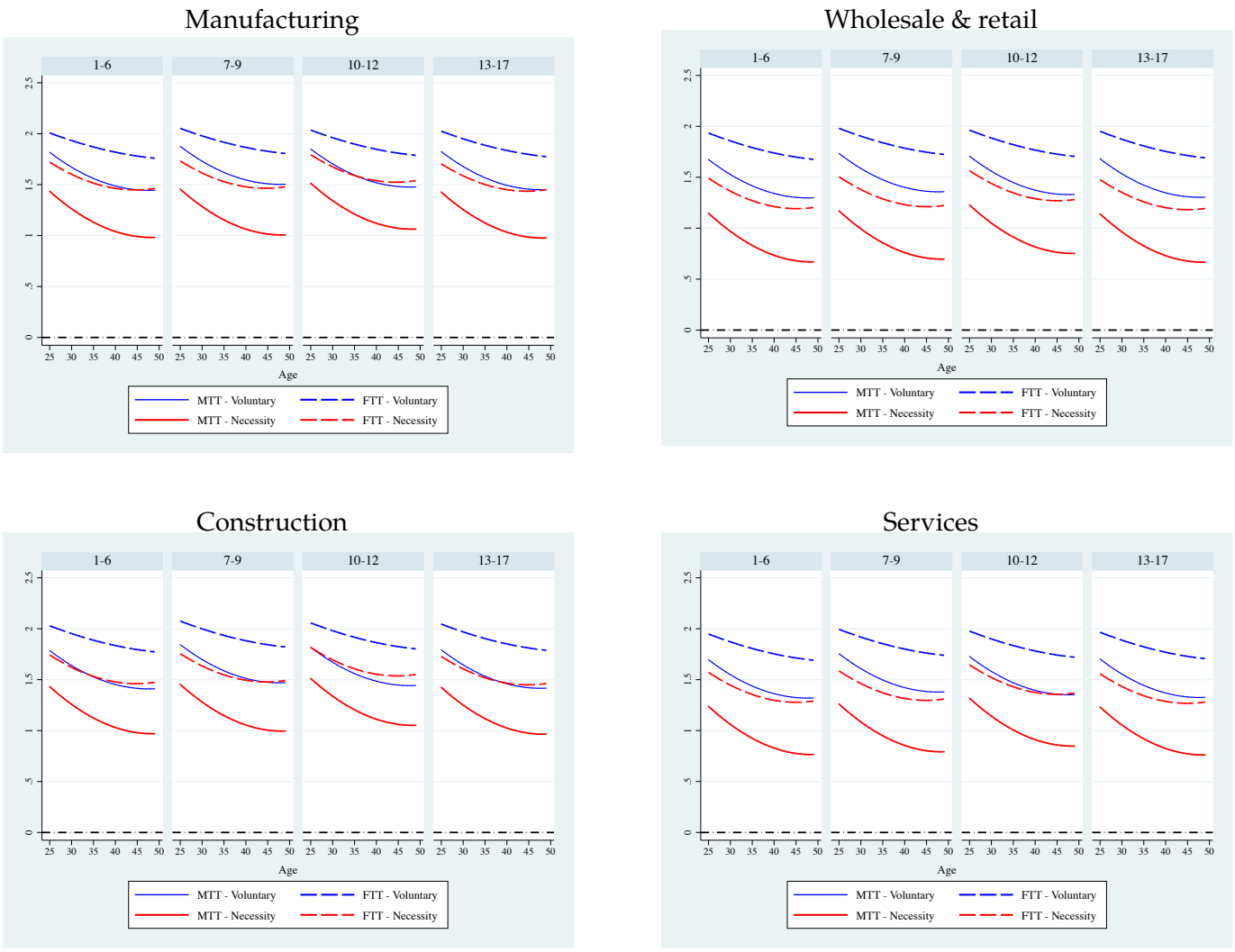



Figure 11: MTT and FTT across age, sector, and years of schooling for the full sample of business owners.

Next, we break down our sample of entrepreneurs into those who have no employees, and those who employ others. Figure 12 shows that entrepreneurs without employees are financially worse off than if they worked for a wage, regardless of whether they entered the sector voluntarily or out of necessity. While they are above the monetary returns, the full returns are not very different from zero for the voluntary entrepreneurs, and considerably below zero for the necessity entrepreneurs. Hence, the self-employed who reported starting their entrepreneurial activities out of necessity are indeed worse off than if they worked for a wage.

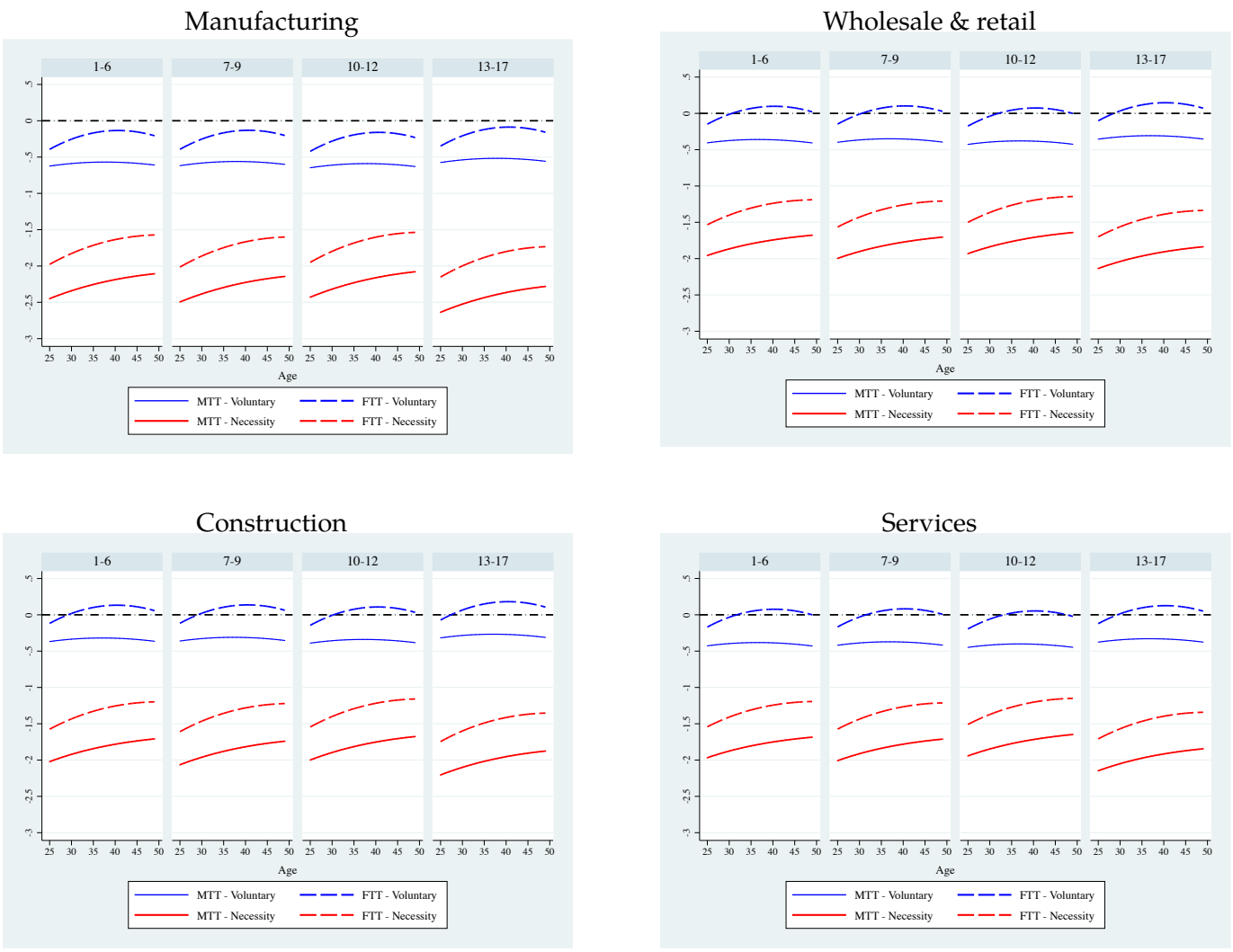



Figure 12: MTT and FTT across age, sector, and years of schooling for entrepreneurs without employees.

In Figure 13 we consider those entrepreneurs who are employers. In this case, the monetary and full returns are positive for both voluntary and necessity entrepreneurs. Interestingly, the voluntary entrepreneurs earn lower monetary and full returns than their necessity counterparts. The large returns for necessity entrepreneurs indicate that their counterfactual earnings as wage workers are extremely low. Another interesting takeaway from Figures 12 and 13 is that non-pecuniary benefits seem to be very important for the self-employed, but less relevant for employers—regardless of whether they are voluntary or necessity business owners.

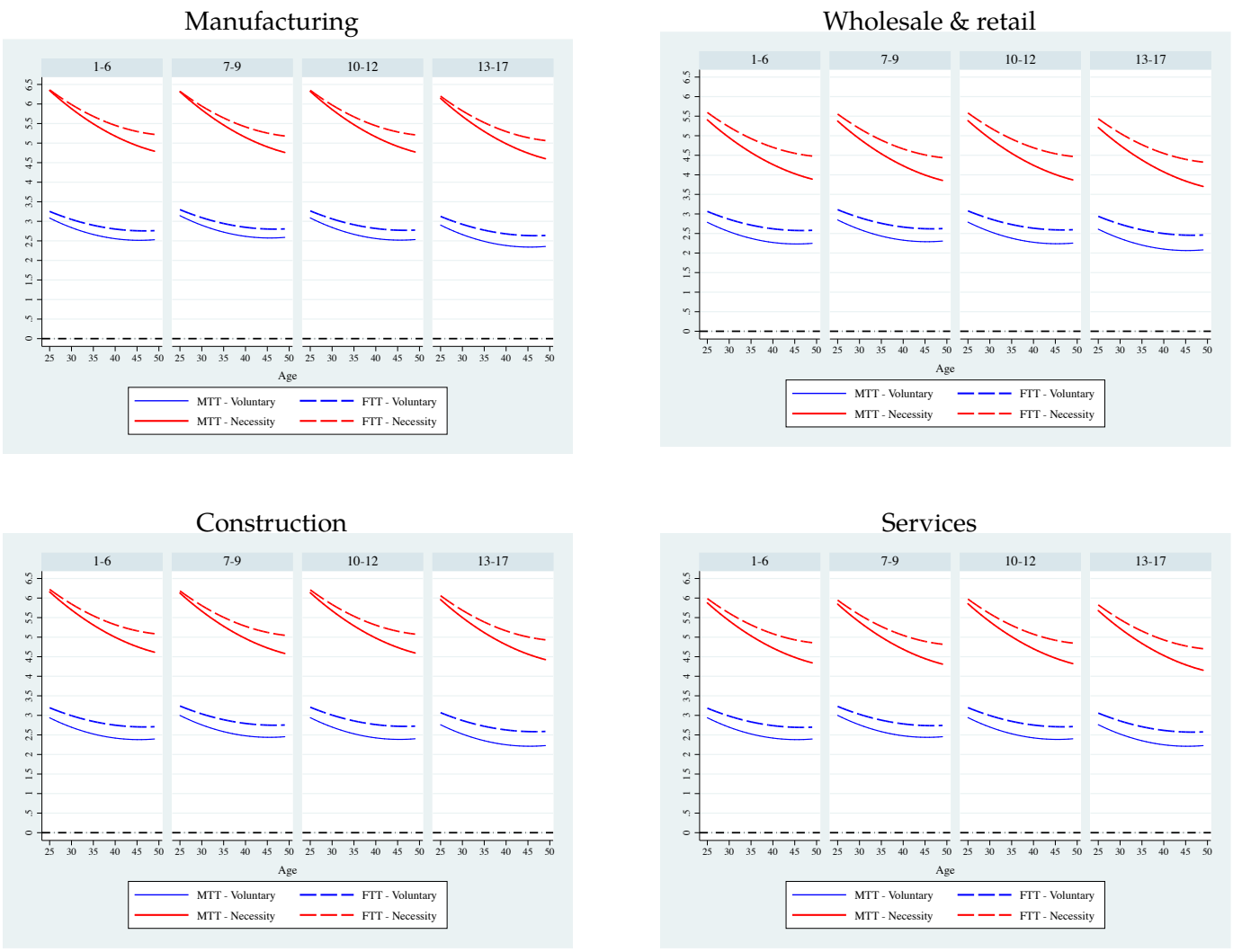



Figure 13: MTT and FTT across age, sector, and years of schooling for employers.

### 4.2 Monetary and full returns across skill groups

Next, we sort workers into groups according to their skill level. High skill workers are those with at least 9 years of schooling in managerial positions—directors, coordinators, chief executives, supervisors—and professionals—lawyers, doctors, professors, engineers. Low skill workers are those with 12 years of schooling or less working in retail or in services. These workers are cooks, waiters, bartenders, domestic workers, hairdressers, gardeners, security guards, door-to-door salesmen, and other low-skill services. The rest are grouped together into a separate category regardless of their formal education. We refer to this last category as medium skill workers, which includes mechanics, electricians, artisans, real-estate agents, secretaries, industrial machinery operators, among others. In the cases of the low and high skill workers there is not enough variation across sectors, so we remove these dummies from the estimation. Figure 14 shows the distribution of earnings across skill levels in each occupation: the earnings of wage workers seem to be more compressed than those of entrepreneurs across all skill levels, and there is a positive correlation between skill and earnings for both wage workers and entrepreneurs.

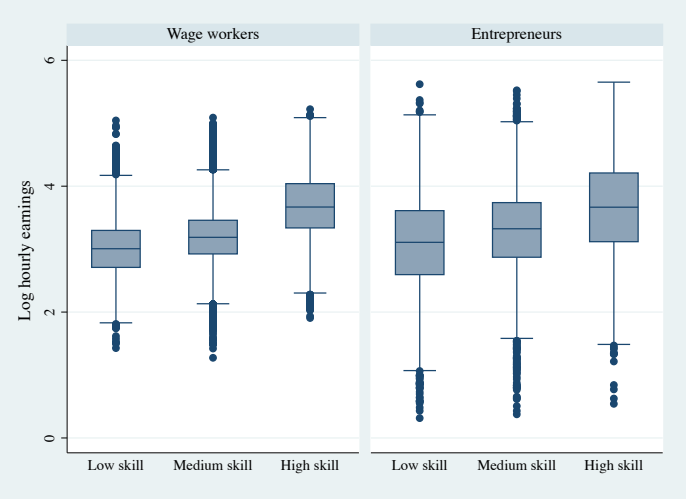



Figure 14: Distribution of hourly earnings in each occupation across levels of skill.

Figure 15 shows the monetary and full return for the entrepreneurs in low skill occupations: the top panel shows that the MTT and the FTT are positive for both the voluntary and necessity entrepreneurs, although the latter have higher returns.

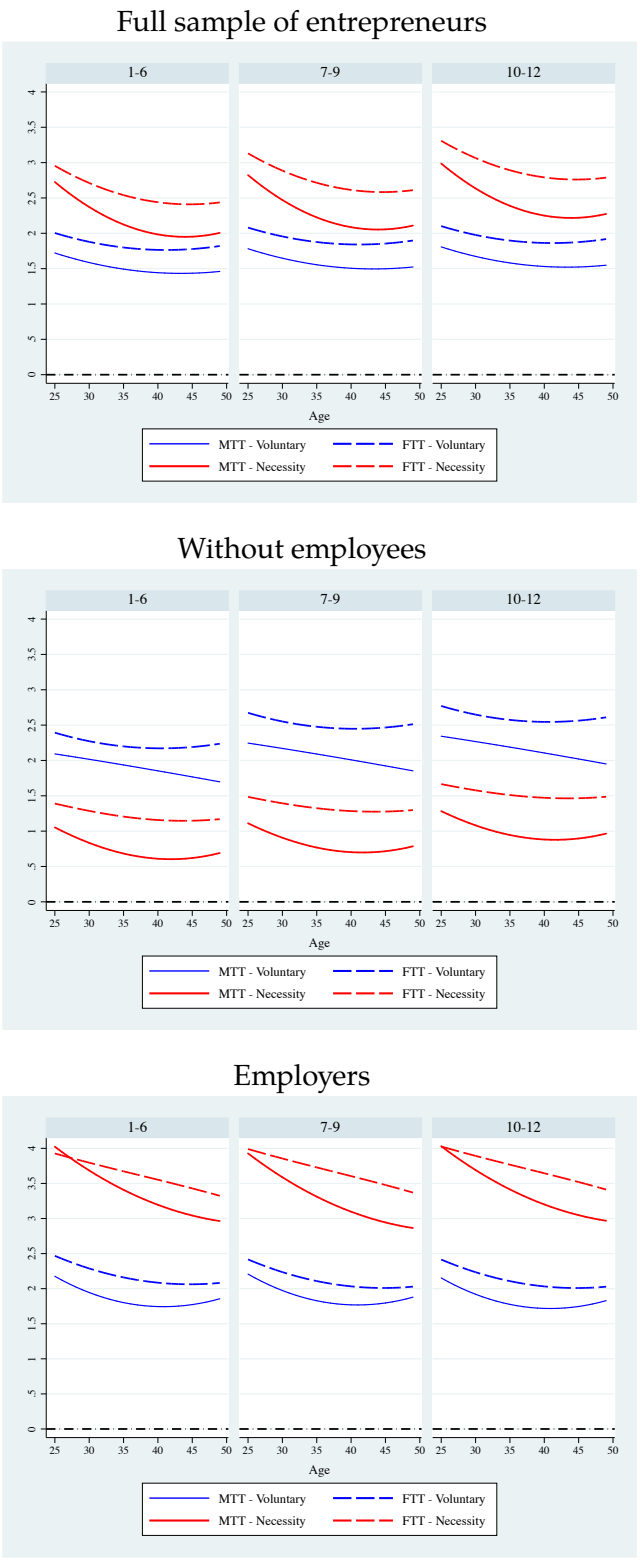



Figure 15: MTT and FTT across age, sector, and years of schooling. Workers in low skill occupations.

Figure 16 shows the MTT and FTT for the sample of medium skill workers. The results are similar

to those obtained using the entire sample: monetary and full returns are large and positive, even for the self-reported necessity entrepreneurs. Non-pecuniary benefits seem to be important for both types of entrepreneurs, although they are somewhat higher for necessity entrepreneurs.

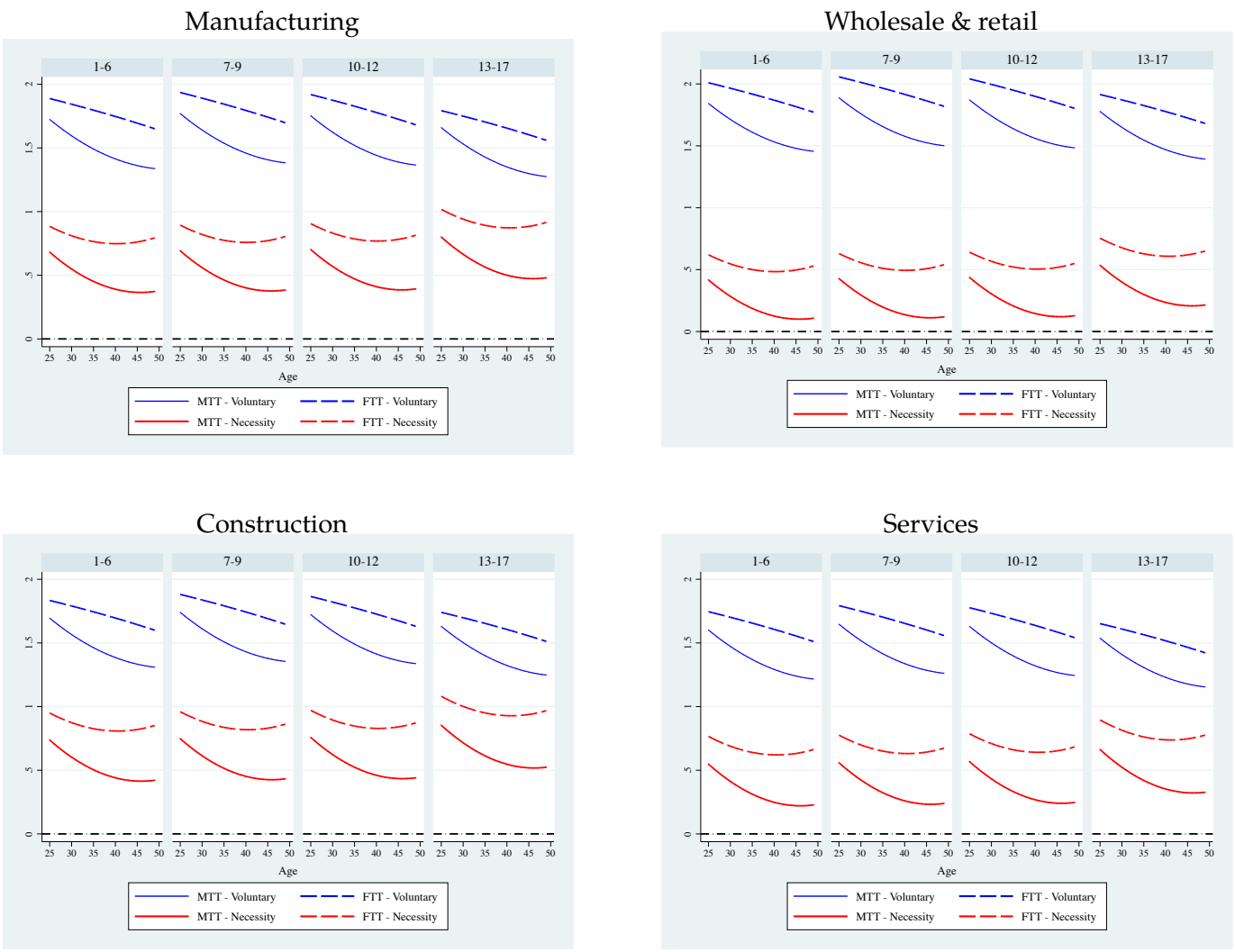



Figure 16: MTT and FTT across age, sector, and years of schooling. Workers in medium skill occupations.

In Figure 17 we consider those medium skill entrepreneurs without employees. In this case, the monetary returns are between -30% and -10% for voluntary entrepreneurs, while their full returns are between -10% and 40%. Thus, non-pecuniary benefits seem to be a major factor for voluntary entrepreneurs. Necessity entrepreneurs, on the other hand, experience negative monetary and full returns, even though the subjective value attached to running their business is high.

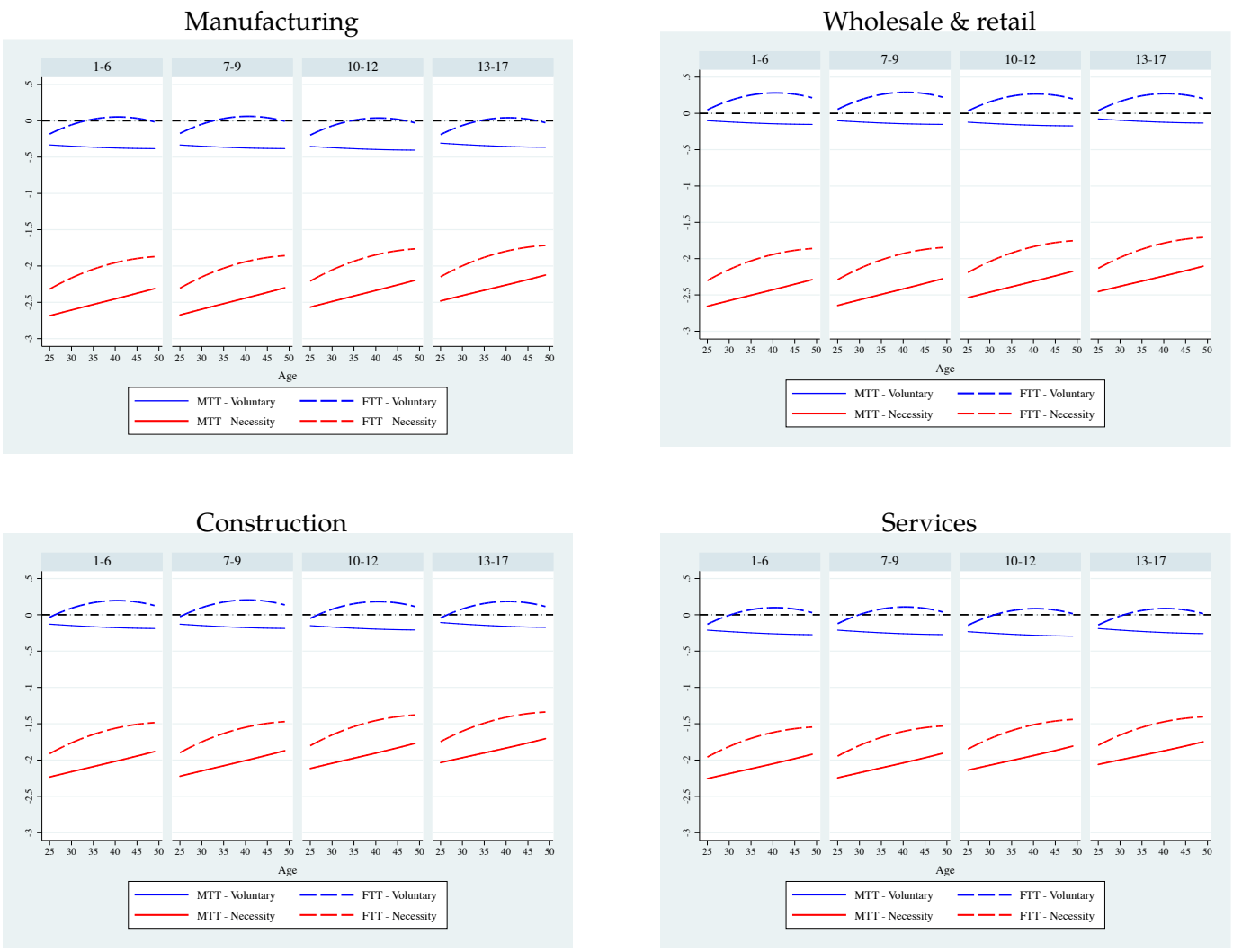



Figure 17: MTT and FTT across age, sector, and years of schooling for entrepreneurs without employees. Workers in medium skill occupations.

Figure 18 considers medium skill employers. The results are similar to those using the entire sample: monetary and full returns are positive for both types of entrepreneurs, and non-pecuniary benefits seem to be relatively small. Once again, returns are higher for necessity entrepreneurs compared to their voluntary counterparts.

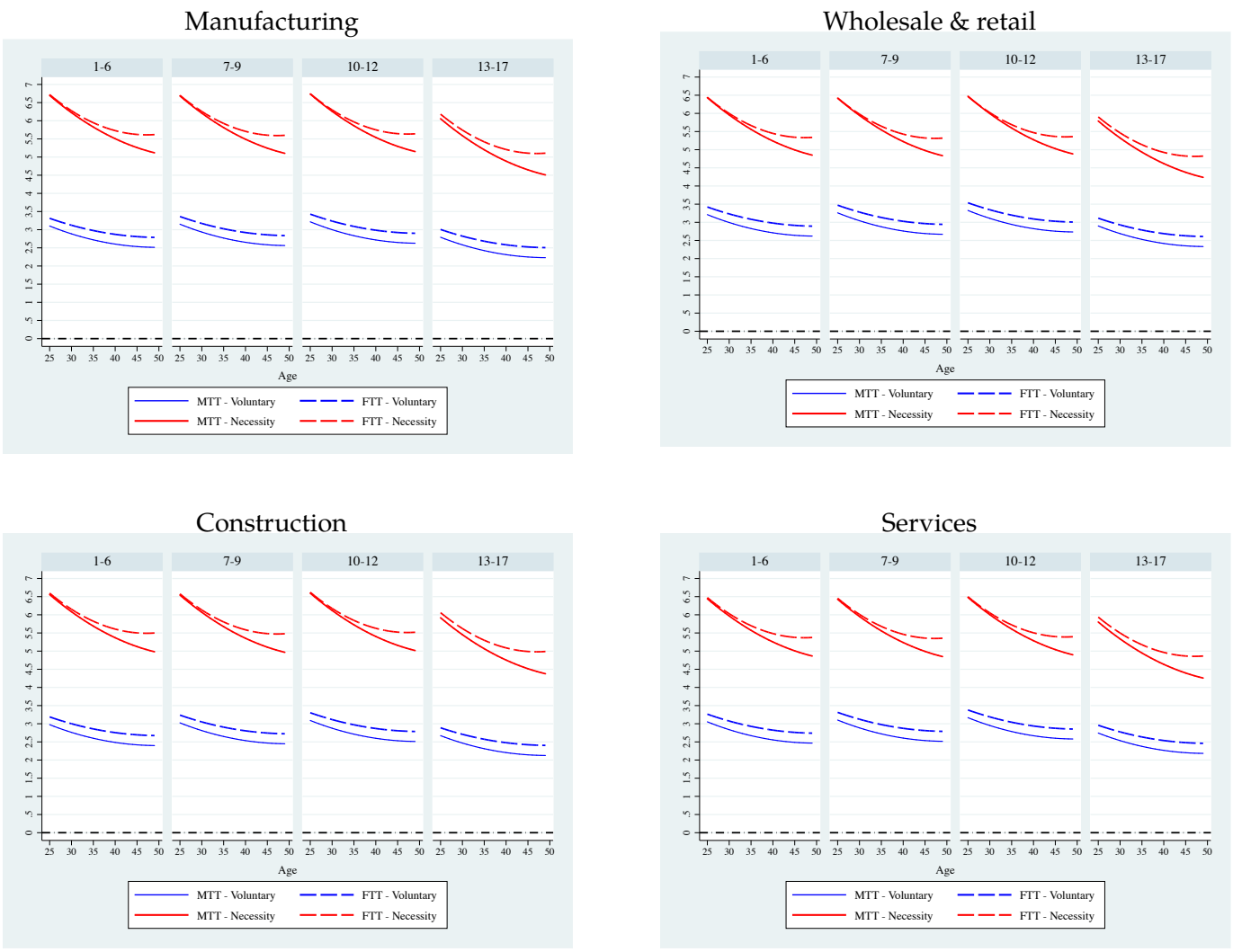
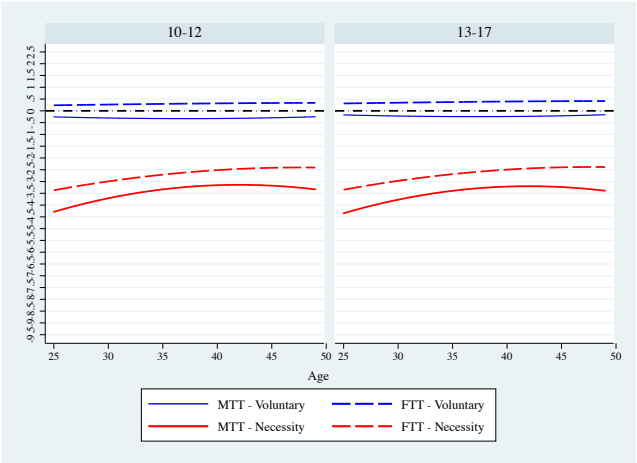


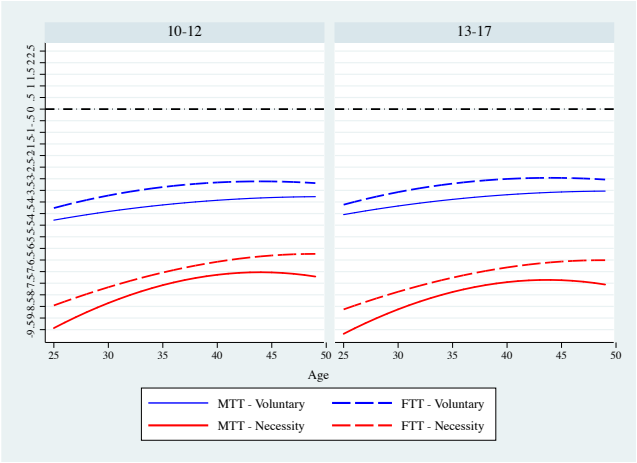

Figure 18: MTT and FTT across age, sector, and years of schooling for employers. Workers in medium skill occupations.

Figure 19 shows the MTT and FTT for the sample of high skill workers, first for all the entrepreneurs, and next splitting the sample between those without employees and employers. The top panel of Figure 19 shows that voluntary entrepreneurs earn less than if they worked for a wage, but that loss is more than compensated once we take into account the value of non-pecuniary benefits. Necessity entrepreneurs, on the other hand, earn negative monetary and full returns. The middle panel in Figure 19 shows that non-employers earn negative monetary and full returns, regardless of the reported reason for starting their business. Last, the bottom panel in Figure 19 shows that voluntary employers earn positive monetary and full returns, while necessity employers earn slightly negative financial returns, but positive full returns.

Full sample of entrepreneurs




Without employees




Employers

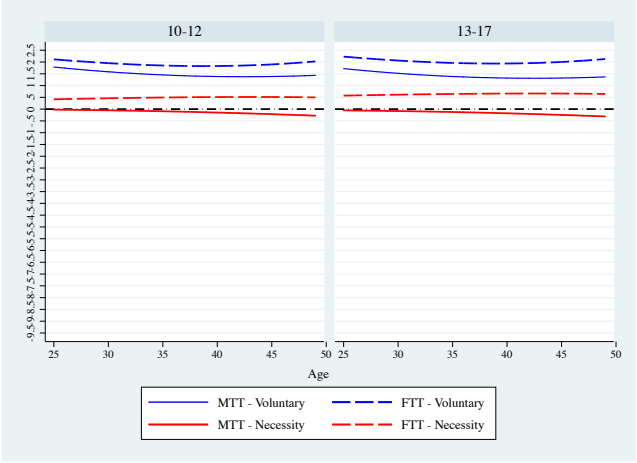



Figure 19: MTT and FTT across age, sector and years of schooling. Workers in high skill occupations.

### 4.3 Monetary and full returns relative to formal and informal wage work

We now consider the returns to entrepreneurship relative to formal and informal wage work. We define informal wage work as that not contributing to social security.[10] Figures 20-22 show that monetary and full returns are large and positive for all entrepreneurs, regardless of the reason for starting their business, and whether or not they have employees. In other words, entrepreneurship unambiguously pays relative to informal wage work.

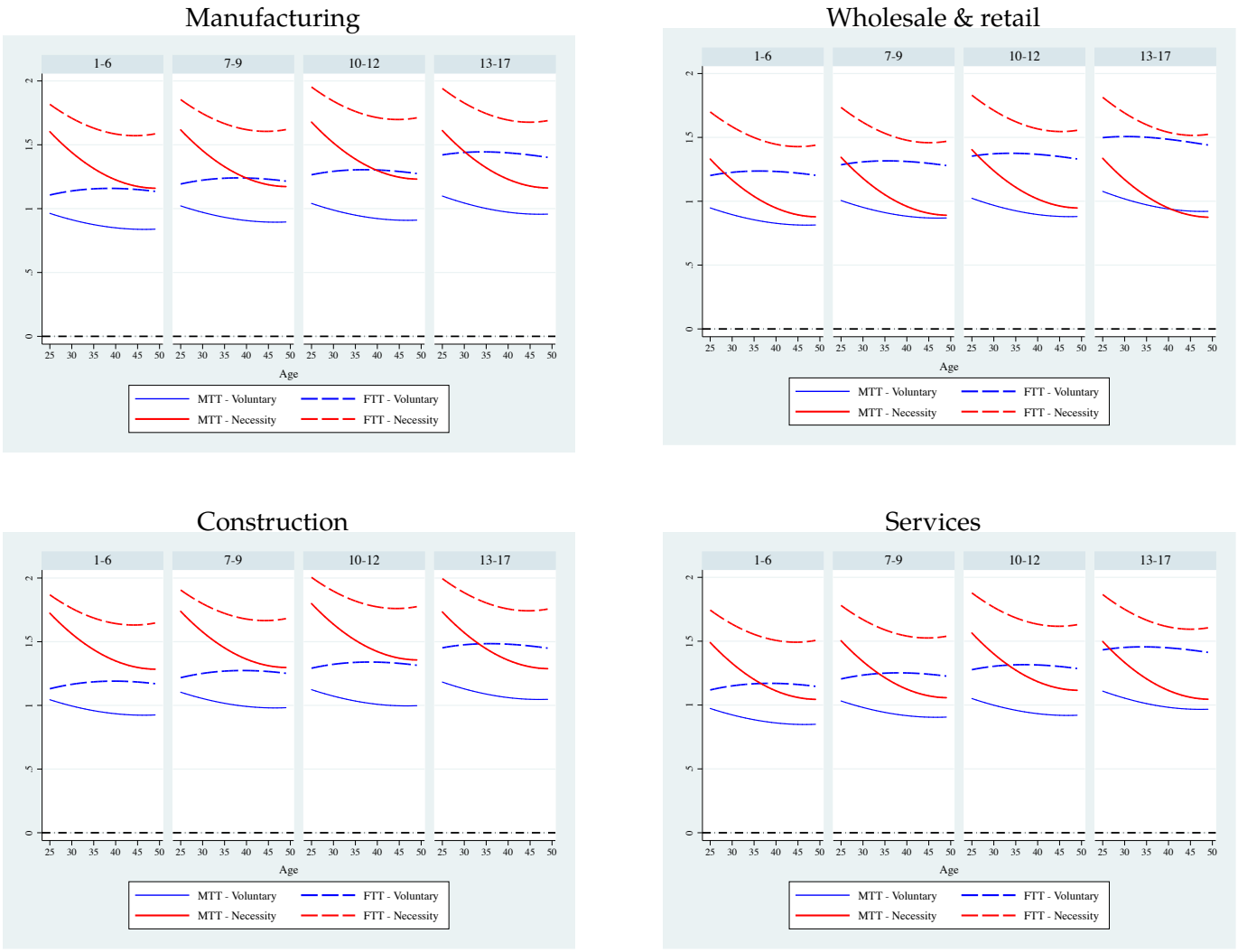



Figure 20: MTT and FTT across age, sector, and years of schooling relative to informal wage work.

[10]Business owners in Mexico are not required to contribute to social security for themselves, but they are required to cover some of their employees: the law requires only salaried labor to be enrolled in IMSS, the Mexican social security administration, but most workers in micro firms are not salaried workers. In this section we do not make that distinction. We consider a worker as informal if he is not covered by IMSS, regardless of the contractual relation with his employer.

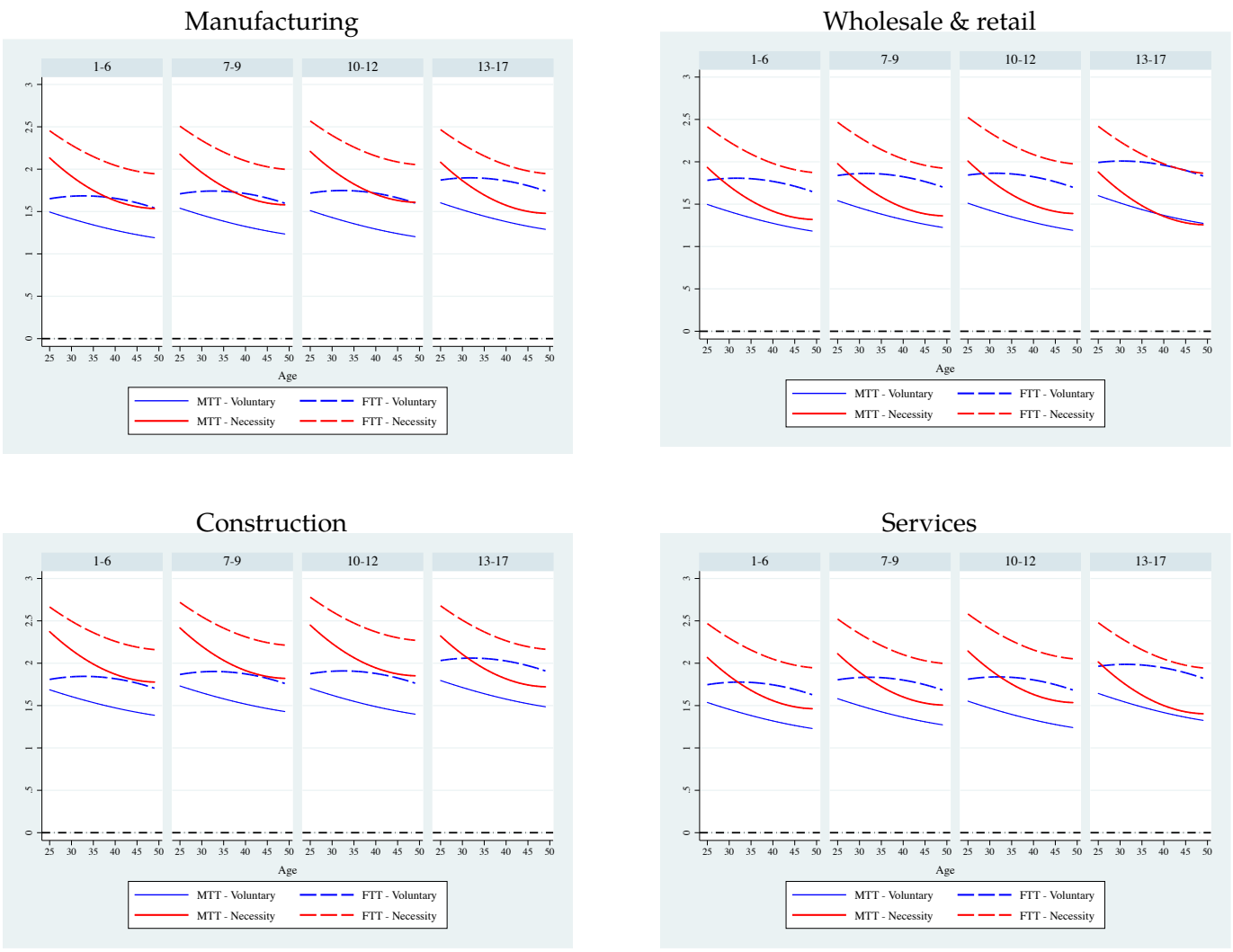



Figure 21: MTT and FTT across age, sector, and years of schooling for entrepreneurs without employees relative to informal wage work.

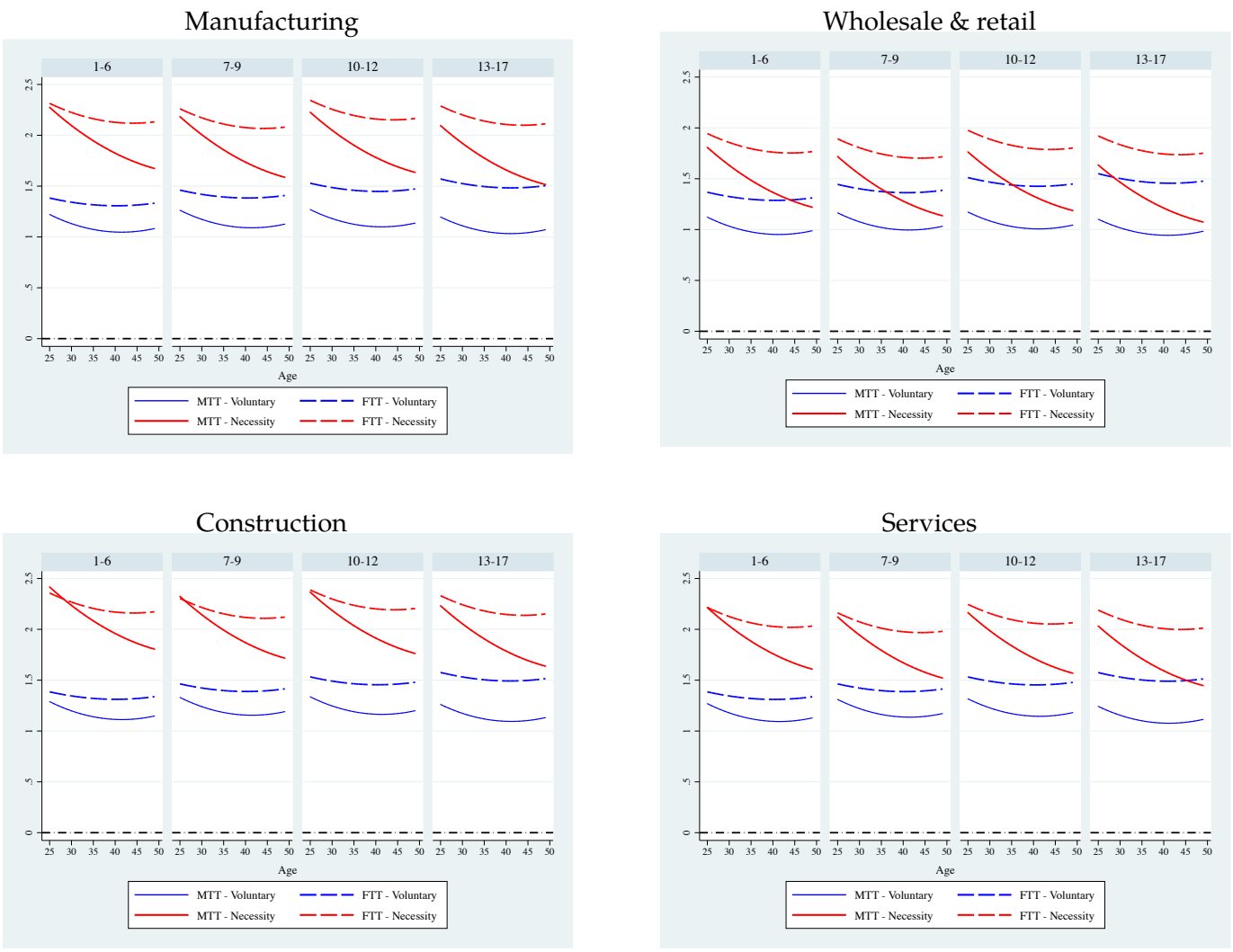



Figure 22: MTT and FTT across age, sector, and years of schooling for employers relative to informal wage work.

In Figures 23-25 we show the returns relative to employment in the formal sector. Figure 23 shows that voluntary entrepreneurs earn positive monetary and full returns, while necessity entrepreneurs earn negative returns. In Figure 24, we show that monetary and full returns relative to formal wage work are negative for those who do not employ others, whether they are voluntary or necessity entrepreneurs. Last, Figure 25 shows that both voluntary and necessity employers earn positive monetary and full returns relative to being an employee in the formal sector.

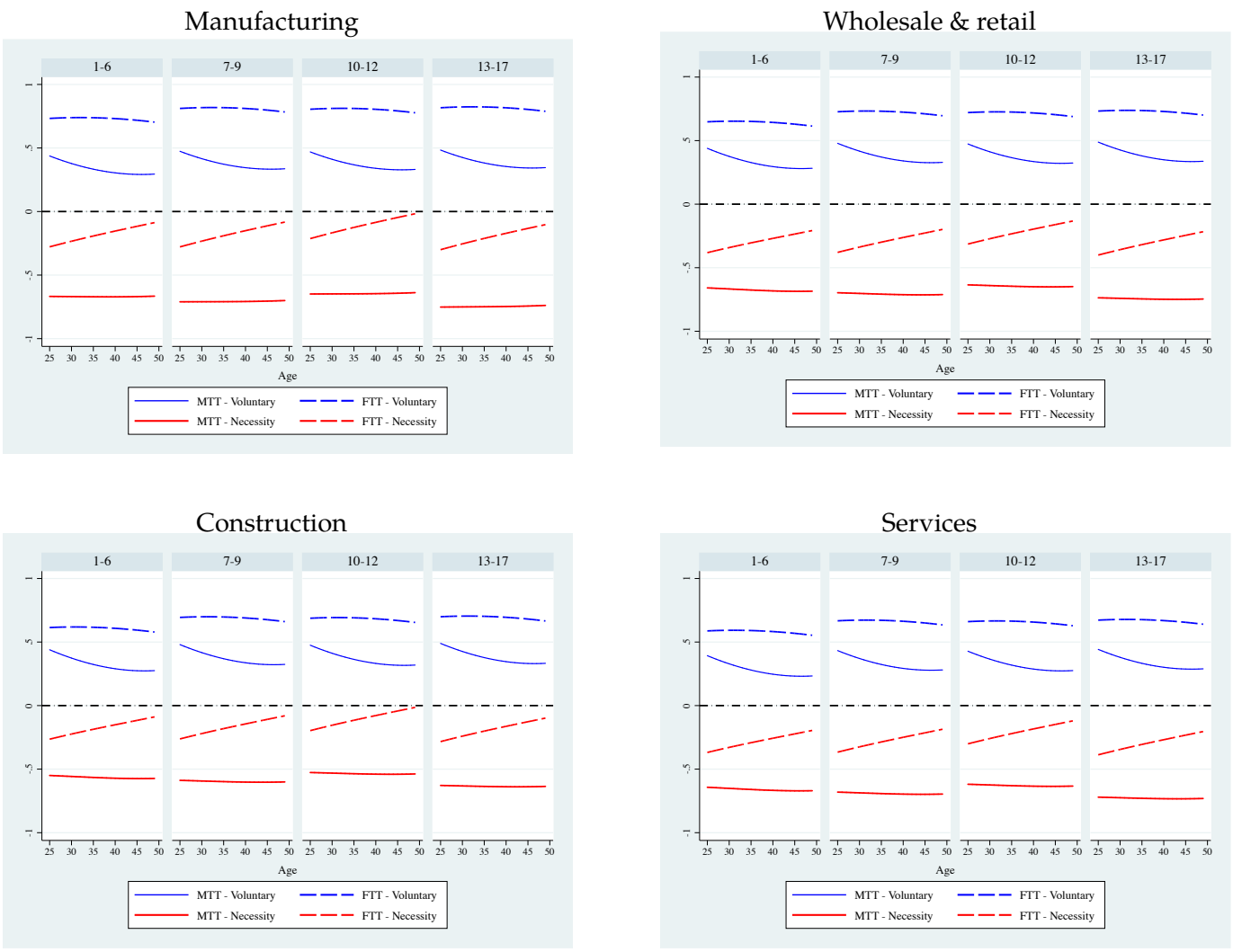



Figure 23: MTT and FTT across age, sector, and years of schooling relative to formal wage work.

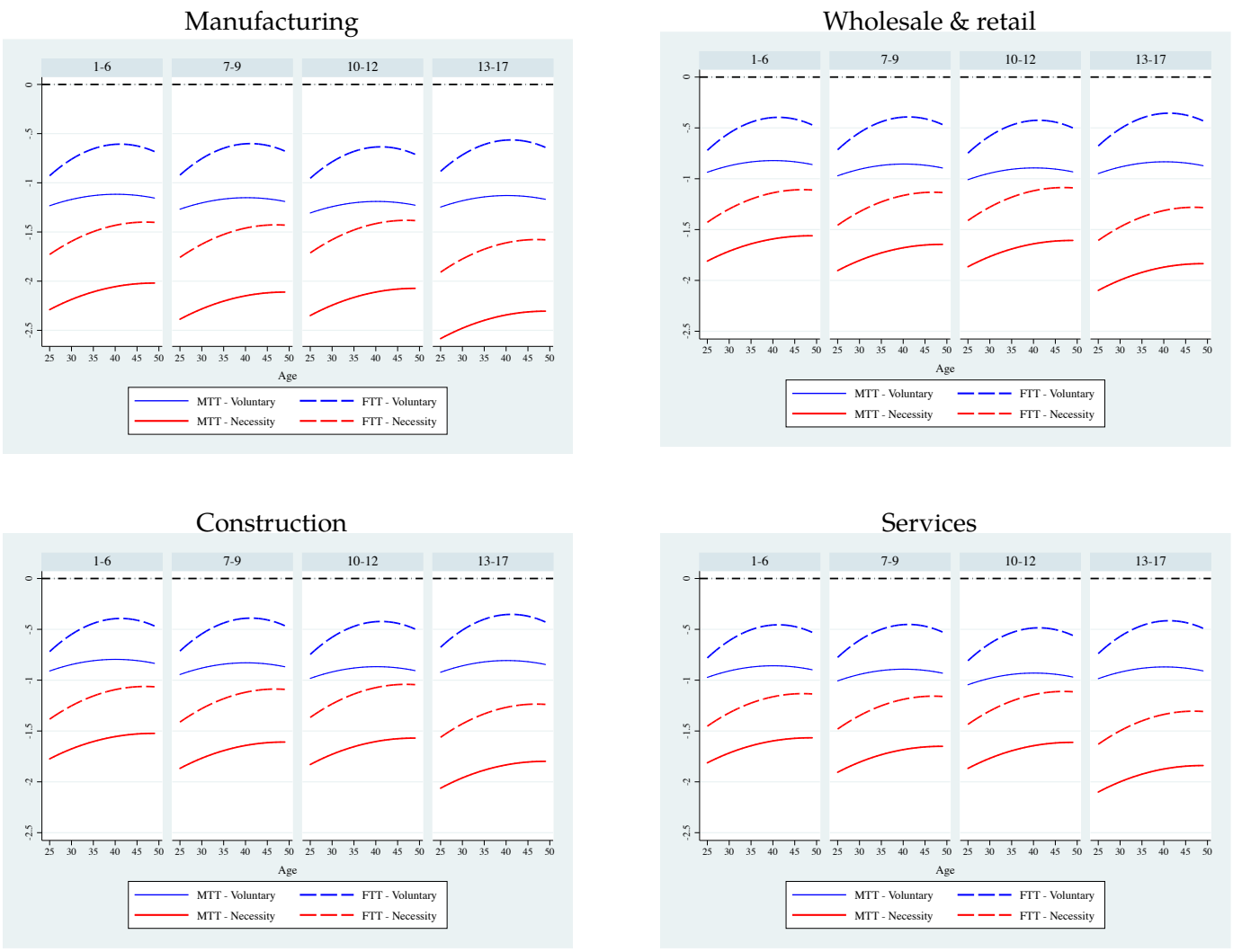



Figure 24: MTT and FTT across age, sector, and years of schooling for entrepreneurs without employees relative to formal wage work.

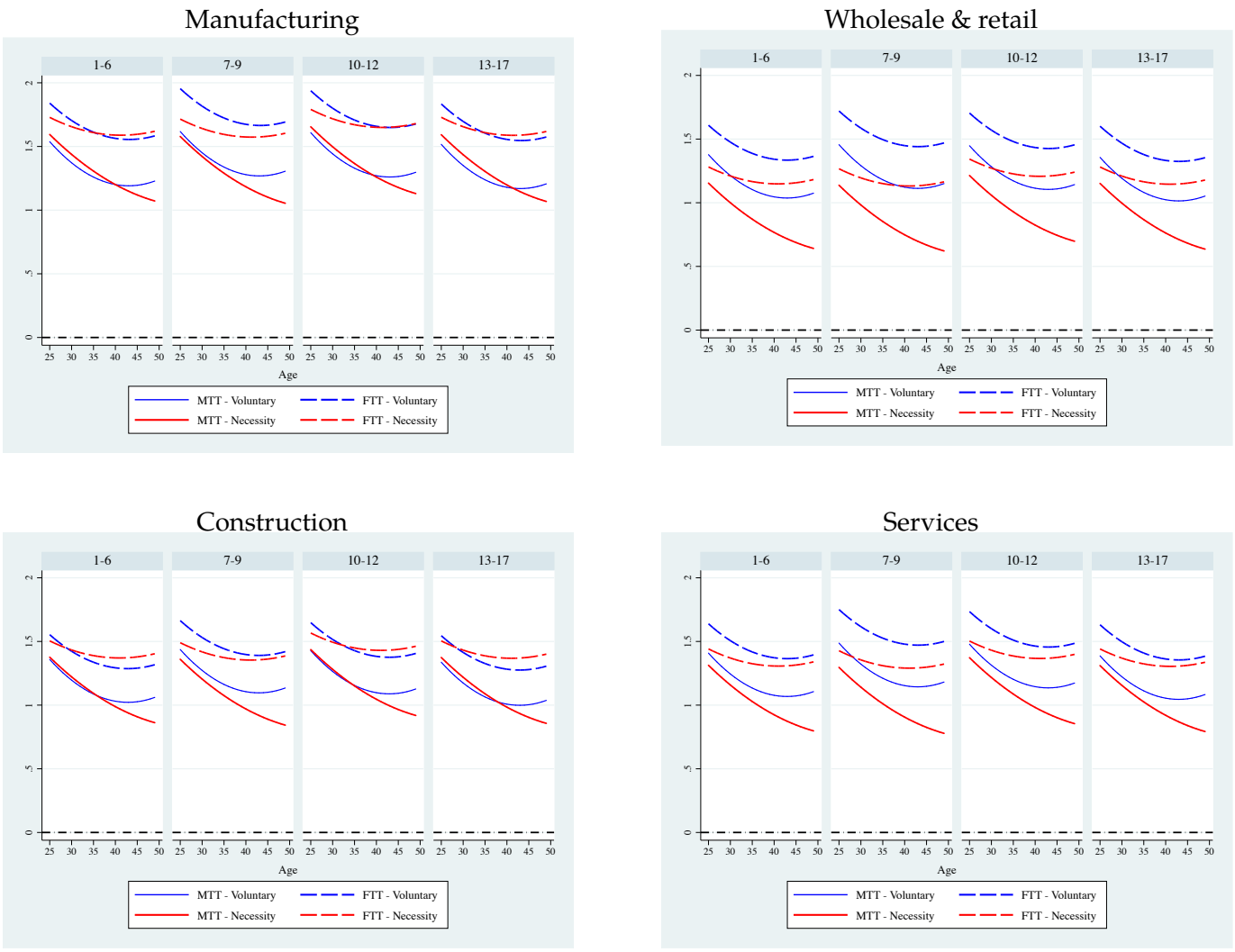



Figure 25: MTT and FTT across age, sector, and years of schooling for employers relative to formal wage work.

# 5 Concluding remarks

Our findings suggest that, in general, those who enter entrepreneurship in Mexico earn a higher return on their talent than if they worked for a wage, regardless of the reported reason for starting their business. However, we find strong evidence of necessity among entrepreneurs in medium and high skill occupations who do not hire employees. These results suggests an inefficient allocation of talent, as these self-employed skilled individuals would earn higher rewards if they worked for a wage. Moreover, we find that entrepreneurs who do not hire others would also be better off as formal sector employees. On the other hand, entrepreneurship, regardless of its scope and nature, unambiguously pays compared to employment in the informal sector.

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# Appendix

In the following tables we present the generalized Roy model estimates for section 4.1 using first the sample of voluntary entrepreneurs and next the sample of self-reported necessity entrepreneurs. The estimates for sections 4.2 and 4.3 are available upon request.

Column 1 in each case shows the OLS estimates using labor earnings as the dependent variable– reported earnings from the ENOE for the wage-workers and reported profits (net of the return on capital) from the ENAMIN for the entrepreneurs. In column 2 we include the monetary value of the non-pecuniary benefits to running a business, that is, we use the reservation earnings for the entrepreneurs instead of their reported profits. Columns 3-6 in each table present the estimates of the generalized Roy model:

- column 3 contains the marginal effect of each regressor from the Probit estimates of equation 4
- column 4 presents the OLS estimation of equation 5 using the sample of wage-workers
- column 5 shows the OLS estimation of equation 6 using the sample of entrepreneurs and reported profits (net of capital returns) as the dependent variable
- column 5 contains the OLS estimates of equation 7 using the monetary value of the non-pecuniary benefits of entrepreneurship as the dependent variable

The tables report bootstrapped standard errors with 400 repetitions in parenthesis. The omitted categories in the estimations are the indicator for Center of the country; the indicator for Area with more than 100,000 residents; the indicator for 10-12 years of schooling; and the indicator for Services.

Table 1: Generalized Roy model estimates on sample of employees and voluntary entrepreneurs

| | (1) OLS estimates of $Y_0$ vs $Y_1$ | (2) OLS estimates of $Y_0$ vs $Y_1 + B$ | (3) Marginal effect from Probit estimates | (4) OLS estimates of $Y_0$ using sample of employees | (5) OLS estimates of $Y_1$ using sample of entrepreneurs | (6) OLS estimates of $B$ using sample of entrepreneurs |
|---|---|---|---|---|---|---|
| D=1 if business owner | 0.094* | 0.506* | | | | |
| | (0.010) | (0.008) | | | | |
| Age | 0.024* | 0.028* | 0.106* | 0.018* | -0.062* | 0.025 |
| | (0.003) | (0.003) | (0.011) | (0.004) | (0.022) | (0.019) |
| Age squared | -0.000* | -0.000* | -0.001* | -0.000* | 0.001* | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| North | 0.094* | 0.091* | -0.095* | 0.107* | 0.169* | -0.009 |
| | (0.005) | (0.004) | (0.014) | (0.005) | (0.025) | (0.024) |
| South | -0.096* | -0.093* | -0.053* | -0.085* | -0.085* | 0.089* |
| | (0.006) | (0.005) | (0.018) | (0.006) | (0.027) | (0.027) |
| Medium-size urban area | -0.100* | -0.097* | 0.113* | -0.119* | -0.168* | -0.030 |
| | (0.006) | (0.006) | (0.018) | (0.006) | (0.032) | (0.027) |
| 1-6 yrs schooling | -0.198* | -0.204* | 0.026 | -0.209* | -0.244* | |
| | (0.007) | (0.006) | (0.020) | (0.006) | (0.030) | |
| 7-9 yrs schooling | -0.109* | -0.115* | -0.060* | -0.099* | -0.067* | |
| | (0.005) | (0.005) | (0.018) | (0.005) | (0.027) | |
| 13-17 yrs schooling | 0.410* | 0.419* | 0.094* | 0.388* | 0.353* | |
| | (0.007) | (0.007) | (0.019) | (0.008) | (0.033) | |
| Manufacturing | 0.085* | 0.080* | -0.412* | 0.171* | 0.335* | |
| | (0.005) | (0.005) | (0.019) | (0.008) | (0.055) | |
| Wholesale & retail | -0.040* | -0.045* | 0.047* | -0.045* | -0.071* | |
| | (0.006) | (0.006) | (0.018) | (0.006) | (0.027) | |
| Construction | 0.186* | 0.165* | -0.061* | 0.191* | 0.287* | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.005) | (0.006) | (0.020) | (0.006) | (0.025) | |
| Married | 0.082* | 0.078* | -0.001 | | | -0.011 |
| | (0.005) | (0.005) | (0.016) | | | (0.025) |
| HH head * children | 0.045* | 0.039* | 0.211* | | | -0.083* |
| | (0.005) | (0.004) | (0.015) | | | (0.030) |
| Mills ratio D = 0 | | | | -0.696* | | |
| | | | | (0.060) | | |
| Mills ratio D = 1 | | | | | -0.813* | -0.174* |
| | | | | | (0.136) | (0.082) |
| R-squared | 0.194 | 0.274 | | 0.204 | 0.111 | 0.017 |
| N | 52,270 | 51,695 | 66,293 | 47,064 | 5,095 | 3,442 |

* $p<0.05$

Table 2: Generalized Roy model estimates on sample of wage-workers and self-reported necessity entrepreneurs

| | (1) OLS estimates of $Y_0$ vs $Y_1$ | (2) OLS estimates of $Y_0$ vs $Y_1 + B$ | (3) Marginal effect from Probit estimates | (4) OLS estimates of $Y_0$ using sample of employees | (5) OLS estimates of $Y_1$ using sample of entrepreneurs | (6) OLS estimates of $B$ using sample of entrepreneurs |
|---|---|---|---|---|---|---|
| D=1 if business owner | -0.089* | 0.380* | | | | |
| | (0.016) | (0.011) | | | | |
| Age | 0.026* | 0.025* | 0.108* | 0.033* | -0.116* | 0.006 |
| | (0.003) | (0.003) | (0.016) | (0.003) | (0.043) | (0.029) |
| Age squared | -0.000* | -0.000* | -0.001* | -0.000* | 0.001* | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| North | 0.093* | 0.089* | -0.101* | 0.095* | 0.209* | -0.087* |
| | (0.004) | (0.005) | (0.020) | (0.005) | (0.042) | (0.037) |
| South | -0.094* | -0.091* | -0.076* | -0.091* | -0.046 | 0.060 |
| | (0.005) | (0.006) | (0.025) | (0.006) | (0.043) | (0.040) |
| Medium-size urban area | -0.098* | -0.101* | 0.065* | -0.099* | -0.137* | -0.008 |
| | (0.006) | (0.006) | (0.026) | (0.006) | (0.052) | (0.045) |
| 1-6 yrs schooling | -0.198* | -0.199* | 0.058* | -0.209* | -0.326* | |
| | (0.006) | (0.006) | (0.028) | (0.006) | (0.046) | |
| 7-9 yrs schooling | -0.113* | -0.112* | -0.025 | -0.110* | -0.151* | |
| | (0.005) | (0.005) | (0.024) | (0.005) | (0.043) | |
| 13-17 yrs schooling | 0.406* | 0.412* | -0.012 | 0.407* | 0.327* | |
| | (0.008) | (0.007) | (0.028) | (0.007) | (0.055) | |
| Manufacturing | 0.089* | 0.088* | -0.460* | 0.129* | 0.613* | |
| | (0.005) | (0.006) | (0.026) | (0.009) | (0.126) | |
| Wholesale & retail | -0.042* | -0.040* | 0.096* | -0.043* | -0.192* | |
| | (0.006) | (0.006) | (0.021) | (0.006) | (0.045) | |
| Construction | 0.183* | 0.177* | -0.222* | 0.197* | 0.529* | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.006) | (0.006) | (0.027) | (0.007) | (0.067) | |
| Married | 0.078* | 0.078* | -0.019 | | | -0.012 |
| | (0.005) | (0.004) | (0.021) | | | (0.034) |
| HH head * children | 0.043* | 0.041* | 0.132* | | | -0.096* |
| | (0.005) | (0.004) | (0.022) | | | (0.036) |
| Mills ratio D = 0 | | | | -0.471* | | |
| | | | | (0.117) | | |
| Mills ratio D = 1 | | | | | -1.170* | -0.116 |
| | | | | | (0.294) | (0.104) |
| R-squared | 0.201 | 0.229 | | 0.202 | 0.105 | 0.021 |
| N | 49,371 | 49,341 | 61,419 | 47,144 | 2,196 | 1,665 |

* $p<0.05$

Table 3: Generalized Roy model estimates on sample of employees and voluntary business owners without employees

| | (1) OLS estimates of $Y_0$ vs $Y_1$ | (2) OLS estimates of $Y_0$ vs $Y_1 + B$ | (3) Marginal effect from Probit estimates | (4) OLS estimates of $Y_0$ using sample of employees | (5) OLS estimates of $Y_1$ using sample of entrepreneurs | (6) OLS estimates of $B$ using sample of entrepreneurs |
|---|---|---|---|---|---|---|
| D=1 if business owner | -0.039* | 0.438* | | | | |
| | (0.014) | (0.012) | | | | |
| Age | 0.026* | 0.027* | 0.093* | 0.038* | 0.010 | 0.055 |
| | (0.003) | (0.003) | (0.014) | (0.003) | (0.036) | (0.029) |
| Age squared | -0.000* | -0.000* | -0.001* | -0.000* | -0.000 | -0.001 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| North | 0.095* | 0.091* | -0.045* | 0.086* | 0.174* | -0.070* |
| | (0.004) | (0.005) | (0.021) | (0.005) | (0.032) | (0.035) |
| South | -0.095* | -0.092* | -0.069* | -0.099* | -0.085* | 0.108* |
| | (0.006) | (0.005) | (0.022) | (0.006) | (0.042) | (0.039) |
| Medium-size urban area | -0.098* | -0.096* | 0.060* | -0.090* | -0.070 | 0.026 |
| | (0.006) | (0.006) | (0.024) | (0.006) | (0.044) | (0.041) |
| 1-6 yrs schooling | -0.195* | -0.198* | 0.090* | -0.202* | -0.231* | |
| | (0.006) | (0.006) | (0.025) | (0.006) | (0.048) | |
| 7-9 yrs schooling | -0.108* | -0.111* | -0.018 | -0.112* | -0.073 | |
| | (0.005) | (0.005) | (0.023) | (0.005) | (0.040) | |
| 13-17 yrs schooling | 0.413* | 0.417* | 0.011 | 0.404* | 0.470* | |
| | (0.007) | (0.008) | (0.027) | (0.008) | (0.049) | |
| Manufacturing | 0.084* | 0.084* | -0.521* | 0.082* | 0.181 | |
| | (0.005) | (0.005) | (0.025) | (0.012) | (0.147) | |
| Wholesale & retail | -0.038* | -0.038* | -0.031 | -0.035* | 0.004 | |
| | (0.006) | (0.006) | (0.021) | (0.006) | (0.043) | |
| Construction | 0.182* | 0.172* | -0.163* | 0.173* | 0.324* | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.006) | (0.006) | (0.025) | (0.007) | (0.054) | |
| Married | 0.080* | 0.077* | -0.084* | | | -0.011 |
| | (0.005) | (0.005) | (0.020) | | | (0.035) |
| HH head * children | 0.043* | 0.039* | 0.132* | | | -0.065 |
| | (0.005) | (0.005) | (0.020) | | | (0.039) |
| Mills ratio D = 0 | | | | 0.165 | | |
| | | | | (0.109) | | |
| Mills ratio D = 1 | | | | | -0.472 | -0.059 |
| | | | | | (0.299) | (0.102) |
| R-squared | 0.201 | 0.238 | | 0.202 | 0.118 | 0.028 |
| N | 49,655 | 49,479 | 61,961 | 47,009 | 2,480 | 1,721 |

* $p<0.05$

Table 4: Generalized Roy model estimates on sample of wage-workers and self-reported necessity entrepreneurs without employees

| | (1) OLS estimates of $Y_0$ vs $Y_1$ | (2) OLS estimates of $Y_0$ vs $Y_1 + B$ | (3) Marginal effect from Probit estimates | (4) OLS estimates of $Y_0$ using sample of employees | (5) OLS estimates of $Y_1$ using sample of entrepreneurs | (6) OLS estimates of $B$ using sample of entrepreneurs |
|---|---|---|---|---|---|---|
| D=1 if business owner | -0.171* | 0.326* | | | | |
| | (0.020) | (0.014) | | | | |
| Age | 0.025* | 0.026* | 0.112* | 0.042* | -0.132 | 0.034 |
| | (0.003) | (0.003) | (0.018) | (0.004) | (0.071) | (0.037) |
| Age squared | -0.000* | -0.000* | -0.001* | -0.000* | 0.001 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.000) |
| North | 0.092* | 0.089* | -0.061* | 0.081* | 0.173* | -0.130* |
| | (0.005) | (0.005) | (0.025) | (0.005) | (0.050) | (0.044) |
| South | -0.095* | -0.092* | -0.099* | -0.108* | -0.044 | 0.072 |
| | (0.006) | (0.005) | (0.028) | (0.006) | (0.071) | (0.052) |
| Medium-size urban area | -0.100* | -0.099* | 0.028 | -0.089* | -0.146* | 0.030 |
| | (0.006) | (0.005) | (0.029) | (0.006) | (0.065) | (0.058) |
| 1-6 yrs schooling | -0.198* | -0.199* | 0.096* | -0.194* | -0.399* | |
| | (0.006) | (0.006) | (0.031) | (0.007) | (0.070) | |
| 7-9 yrs schooling | -0.111* | -0.111* | -0.013 | -0.112* | -0.153* | |
| | (0.005) | (0.005) | (0.028) | (0.005) | (0.052) | |
| 13-17 yrs schooling | 0.406* | 0.410* | -0.067 | 0.397* | 0.320* | |
| | (0.008) | (0.008) | (0.035) | (0.008) | (0.078) | |
| Manufacturing | 0.086* | 0.088* | -0.573* | 0.046* | 0.656* | |
| | (0.005) | (0.005) | (0.036) | (0.012) | (0.292) | |
| Wholesale & retail | -0.039* | -0.038* | 0.030 | -0.030* | -0.077 | |
| | (0.006) | (0.005) | (0.026) | (0.006) | (0.055) | |
| Construction | 0.181* | 0.178* | -0.261* | 0.151* | 0.590* | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.006) | (0.005) | (0.033) | (0.008) | (0.135) | |
| Married | 0.077* | 0.078* | -0.052* | | | 0.023 |
| | (0.005) | (0.005) | (0.025) | | | (0.042) |
| HH head * children | 0.043* | 0.040* | 0.077* | | | -0.069 |
| | (0.004) | (0.005) | (0.025) | | | (0.042) |
| Mills ratio D = 0 | | | | 0.781* | | |
| | | | | (0.161) | | |
| Mills ratio D = 1 | | | | | -1.322* | 0.089 |
| | | | | | (0.574) | (0.127) |
| R-squared | 0.206 | 0.218 | | 0.202 | 0.088 | 0.022 |
| N | 48,542 | 48,564 | 60,244 | 47,156 | 1,367 | 1,073 |

* $p<0.05$

Table 5: Generalized Roy model estimates on sample of employees and voluntary employers

| | (1) OLS estimates of $Y_0$ vs $Y_1$ | (2) OLS estimates of $Y_0$ vs $Y_1 + B$ | (3) Marginal effect from Probit estimates | (4) OLS estimates of $Y_0$ using sample of employees | (5) OLS estimates of $Y_1$ using sample of entrepreneurs | (6) OLS estimates of $B$ using sample of entrepreneurs |
|---|---|---|---|---|---|---|
| D=1 if business owner | 0.220* | 0.579* | | | | |
| | (0.014) | (0.013) | | | | |
| Age | 0.023* | 0.026* | 0.098* | 0.014* | -0.044 | -0.005 |
| | (0.004) | (0.003) | (0.014) | (0.004) | (0.028) | (0.027) |
| Age squared | -0.000* | -0.000* | -0.001* | -0.000* | 0.001 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| North | 0.092* | 0.092* | -0.126* | 0.119* | 0.125* | 0.058 |
| | (0.005) | (0.005) | (0.019) | (0.005) | (0.036) | (0.037) |
| South | -0.095* | -0.094* | -0.034 | -0.086* | -0.124* | 0.068 |
| | (0.006) | (0.006) | (0.021) | (0.006) | (0.034) | (0.037) |
| Medium-size urban area | -0.102* | -0.101* | 0.139* | -0.132* | -0.187* | -0.086* |
| | (0.005) | (0.005) | (0.022) | (0.006) | (0.041) | (0.041) |
| 1-6 yrs schooling | -0.197* | -0.201* | -0.035 | -0.193* | -0.220* | |
| | (0.006) | (0.006) | (0.024) | (0.006) | (0.045) | |
| 7-9 yrs schooling | -0.110* | -0.114* | -0.088* | -0.090* | -0.091* | |
| | (0.005) | (0.005) | (0.020) | (0.005) | (0.042) | |
| 13-17 yrs schooling | 0.405* | 0.412* | 0.143* | 0.372* | 0.285* | |
| | (0.008) | (0.008) | (0.024) | (0.008) | (0.045) | |
| Manufacturing | 0.085* | 0.082* | -0.257* | 0.148* | 0.122* | |
| | (0.005) | (0.005) | (0.023) | (0.006) | (0.050) | |
| Wholesale & retail | -0.044* | -0.047* | 0.112* | -0.065* | -0.144* | |
| | (0.006) | (0.006) | (0.020) | (0.006) | (0.042) | |
| Construction | 0.180* | 0.170* | 0.041 | 0.168* | 0.194* | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.006) | (0.006) | (0.024) | (0.006) | (0.035) | |
| Married | 0.077* | 0.077* | 0.074* | | | -0.015 |
| | (0.005) | (0.005) | (0.019) | | | (0.036) |
| HH head * children | 0.040* | 0.039* | 0.243* | | | -0.105* |
| | (0.004) | (0.005) | (0.019) | | | (0.044) |
| Mills ratio D = 0 | | | | -1.085* | | |
| | | | | (0.063) | | |
| Mills ratio D = 1 | | | | | -0.334* | -0.333* |
| | | | | | (0.142) | (0.129) |
| R-squared | 0.208 | 0.259 | | 0.207 | 0.105 | 0.013 |
| N | 49,790 | 49,391 | 62,685 | 46,699 | 2,615 | 1,721 |

* $p<0.05$

Table 6: Generalized Roy model estimates on sample of wage-workers and self-reported necessity employers

| | (1) OLS estimates of $Y_0$ vs $Y_1$ | (2) OLS estimates of $Y_0$ vs $Y_1 + B$ | (3) Marginal effect from Probit estimates | (4) OLS estimates of $Y_0$ using sample of employees | (5) OLS estimates of $Y_1$ using sample of entrepreneurs | (6) OLS estimates of $B$ using sample of entrepreneurs |
|---|---|---|---|---|---|---|
| D=1 if business owner | 0.043 | 0.477* | | | | |
| | (0.025) | (0.021) | | | | |
| Age | 0.026* | 0.025* | 0.083* | 0.030* | -0.012 | -0.018 |
| | (0.003) | (0.003) | (0.022) | (0.003) | (0.061) | (0.047) |
| Age squared | -0.000* | -0.000* | -0.001* | -0.000* | -0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.001) |
| North | 0.093* | 0.091* | -0.146* | 0.116* | 0.194* | -0.002 |
| | (0.005) | (0.005) | (0.030) | (0.005) | (0.079) | (0.072) |
| South | -0.092* | -0.092* | -0.030 | -0.090* | -0.071 | 0.039 |
| | (0.006) | (0.005) | (0.032) | (0.006) | (0.060) | (0.060) |
| Medium-size urban area | -0.098* | -0.101* | 0.106* | -0.117* | -0.086 | -0.085 |
| | (0.005) | (0.006) | (0.033) | (0.006) | (0.075) | (0.070) |
| 1-6 yrs schooling | -0.196* | -0.196* | -0.022 | -0.198* | -0.211* | |
| | (0.006) | (0.006) | (0.038) | (0.006) | (0.076) | |
| 7-9 yrs schooling | -0.111* | -0.111* | -0.041 | -0.104* | -0.177* | |
| | (0.005) | (0.006) | (0.035) | (0.005) | (0.070) | |
| 13-17 yrs schooling | 0.409* | 0.411* | 0.062 | 0.394* | 0.315* | |
| | (0.008) | (0.008) | (0.036) | (0.008) | (0.080) | |
| Manufacturing | 0.089* | 0.086* | -0.213* | 0.131* | 0.266* | |
| | (0.005) | (0.005) | (0.037) | (0.006) | (0.097) | |
| Wholesale & retail | -0.043* | -0.042* | 0.184* | -0.077* | -0.264* | |
| | (0.006) | (0.006) | (0.030) | (0.007) | (0.085) | |
| Construction | 0.180* | 0.177* | -0.106* | 0.198* | 0.314* | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.006) | (0.006) | (0.041) | (0.006) | (0.077) | |
| Married | 0.077* | 0.077* | 0.041 | | | -0.101 |
| | (0.005) | (0.005) | (0.030) | | | (0.063) |
| HH head * children | 0.039* | 0.040* | 0.187* | | | -0.167* |
| | (0.005) | (0.005) | (0.031) | | | (0.076) |
| Mills ratio D = 0 | | | | -2.050* | | |
| | | | | (0.169) | | |
| Mills ratio D = 1 | | | | | -0.343 | -0.472* |
| | | | | | (0.325) | (0.203) |
| R-squared | 0.207 | 0.223 | | 0.204 | 0.136 | 0.051 |
| N | 48,004 | 47,952 | 59,528 | 46,876 | 829 | 592 |

* $p<0.05$