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Transforming informal work and livelihoods in Costa Rica[1]

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Abstract: By a variety of measures, a large proportion of workers in developing economies work in the informal sector. A key question is whether workers are in the informal sector involuntary because they are rationed out of a limited number of formal sector jobs, or voluntarily because of comparative advantage or preferences. We further distinguish between wage employees self-employed workers. Separately, for wage employees and self-employed, we separate formal from informal, and construct a heterogeneous informal sector. Specifically, upper-tier informal wage employees, where employers comply with some but not all labor protections and regulations, and lower-tier informal wage employees, where employers comply with no labor protections or regulations. Using an individual-level panel data set to examine whether transitions between sectors and wage changes when workers change sectors are consistent with voluntary or involuntary informal employment. We find evidence that lower-tier informal wage employees are involuntarily informal. On the other hand, we find evidence that informal self-employed workers and upper-tier informal wage employees are in those informal jobs voluntarily. Our results imply that the involuntary informal sector in Costa Rica is small. Only 6.3% of workers and 15% of informal workers are in involuntary lower-tier informal wage employment. We find that having more education, both formal education and vocational training, is the most important measurable factor that increases the probability that a lower tier informal sector worker will transition into a upper-informal or formal work.

I. Introduction

By a variety of measures, a large proportion of workers in developing economies are in the informal sector; where compliance with regulations is weak, wages and productivity are low, workers do not receive legally mandated government labor protections, and workers or employers do not pay legally mandated payroll or income taxes. For those interested in the structure of the labor market, a key question is whether workers are in the informal sector voluntarily, or in that sector involuntary because they are rationed out of a limited number of formal sector jobs.

In the labor market segmentation theory of dualistic labor markets wages are institutionally set at higher than equilibrium (market) levels. Institutional mechanisms for maintaining above market levels of wages in the formal sector include minimum wages and labor protections only enforced in the formal sector, the market power of large formal sector firms, collective bargaining (unions) and public sector wage policies. The vast majority of workers want to work in the high wage formal sector, but not all are able to find formal work because formal sector jobs are

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limited (i.e. Harris and Todaro, 1970; Fields, 1975). Wages and employment in the informal sector are not subject to the regulations and other institutional mechanisms that maintain higher than equilibrium wages in the formal sector. There are no limits on the number of informal sector jobs and wages are set at equilibrium. In the informal sector, where these institutional mechanisms do apply, wages are set at the equilibrium (market) level, which is also low because of the artificially high supply of labor because informal workers are limited in their ability to move to the formal sector. Labor market segmentation is the cause of dualistic labor markets, and the reason that wages in the formal sector are higher than wages in the informal sector (for workers with the same productivity). The informal sector is where workers who are not able to find formal sector work find employment, albiet at low wages. In this case, most workers are in the informal sector involuntarily because they have not been able to obtain one of the limited high-wage formal sector jobs.

Others argue that labor market segmentation is not the reason that workers are in the informal sector (i.e. Maloney, 1999). In this view formal sector wages are not set above equilibrium, formal sector employment is not limited and workers are able to freely move between the formal and informal sectors. In his view, workers choose the informal sector. Workers choose the informal sector voluntarily because of comparative advantage or preference. These workers value the flexibility in working conditions, can avoid the costs of formalization such as social security payroll taxes and other mandatory taxes, or they are entrepreneurs who find the government regulations or corruption needed to start a new business too costly (i.e. DeSoto, 1989; Maloney, 1999). The free mobility of workers from the informal to formal sector will equalize wages between these sectors, leading to equal wages in both sectors for equivalent workers (where wages include all components of remuneration, including compensating differentials because of different preferences).

More recent views of dualistic labor markets recognize that voluntary and involuntary informality coexist, and distinguish between those informal workers who are voluntarily informal ("upper-tier informal" workers) vs. others who are involuntarily informal because they are limited in their access to the formal employment which they would prefer ("lower-tier informal" workers) (i.e. Fields, 1990; Maloney, 2004; Gunther and Launov, 2012). A second type of heterogeneity in the informal sector is between those who are informal employees in firms and those who are self-employed. Self-employed workers may also be either voluntary (formal and "upper-tier informal self-employed") or involuntary ("lower-tier informal self-employment"). It is important to distinguish between self-employed and employees because the characteristics of these jobs are different or workers may have a comparative advantage in self-employment or wage employment and therefore workers may be voluntarily choosing to become the lower informal self-employed but are involuntarily in lower-tier informal wage employees, or vice-versa. A more practical reason is that wages may not be comparable between employees and self-employed because the earnings of the self-employed include returns to capital, entrepreneurship and labor, while the wages of employees include only returns to labor. Both of these reasons suggest that while wage comparisons between informal and formal wage employees, and between formal and informal self-employed workers, are likely to be reliable. However, comparisons wage comparisons between self-employed and wage employees should be interpreted with caution.

In the literature, informality may be defined relative to the employer or the worker. In this paper we focus on workers and follow the International Labor Organization (ILO) Thesaurus definition of informal work as comprising "all remunerative work (i.e. both self-employment and wage employment) that is not registered, regulated or protected by existing legal or regulatory framework, as well as non-remunerative work undertaken in an income-producing enterprise." Using the ILO framework, we consider six potential dualistic sectors: formal wage employees, formal self-employed, upper-tier informal wage employees, upper-tier informal self-employed, lower-tier informal wage employees, and lower-tier informal self-employed. Formal workers and employers are registered and comply with all legal labor protection regulations, upper-informal workers follow some but not all of these laws and regulations, and lower-informal workers are neither registered not comply with legal labor protection regulations.

It is a primary purpose of this paper to provide evidence on whether workers are in the informal sectors voluntary or involuntarily; workers are in the informal sector voluntarily if there is labor market segmentation between those we identify informal workers vs. formal workers. To provide evidence of labor market segmentation we use an individual-level panel data set created by the Costa Rican National Institute of Statistics to test whether wages increase when workers with the same personal characteristics transition from the informal to formal sectors, and decrease when workers transition from formal to informal sectors. Further, once we identify those sectors that are segmented, we examine which personal characteristics are correlated with a transition from involuntary lower-tier informal wage employment and self-employment into higher wage voluntary formal and upper-tier informal wage employment.

Our results suggest that in Costa Rica there is labor market segmentation between both formal wage employment and upper-tier informal wage employment vs. lower-tier informal wage employment. That is, we present evidence that lower-tier informal wage employees are in the informal sector involuntarily. We also find some evidence of labor market segmentation between lower-tier informal self-employed vs. formal and upper-tier informal wage employment. However, we find no evidence of labor market segmentation between formal wage employees and upper-tier informal employees, suggesting that upper-tier informal employees are voluntarily informal. Similarly, we find no evidence of labor market segmentation between formal wage employees and formal self-employed, nor between formal self-employed and upper-tier informal self-employed, suggesting that workers are also in these self-employed sectors voluntarily.

Our results suggest that involuntary informal employment is small in Costa Rica. , both as a percent of wage employment, and as a percent of self-employment. We estimate that only 15% to 22% of all informal workers are in one of lower-tier informal sectors (depending on whether or not we include lower-tier informal self-employed or not). Put another way, 78-85% of informal workers are voluntary (including both the in upper-tier informal wage employees and self-employed). In part, this reflects the Costa Rican government's efforts to universalize access to Social Security. The two largest working sectors are formal wage employment and upper-tier informal wage employment (53% and 18.5% of all workers, respectively).

Lower-tier informal workers can improve earnings, family incomes and livelihoods by moving to upper-tier informal and formal sectors, or by staying as lower tier informal workers and improving their income earning assets. We estimate multinomial logit transition equations to

examine the individual characteristics correlated with a transition from the lower-tier informal sectors into formal and upper-tier informal work. Our evidence suggests that gaining additional human capital (formal education and vocational training) is an effective way to improve earnings for lower-tier informal sector worker who do not move into formal or upper-tier informal employment. Further, we find that lower-tier informal sector workers with higher human capital, both formal and vocational education, increases the probability that a lower-tier informal worker will move into the formal and upper-tier informal sectors. As human capital both increases the probability of moving to formal or upper-tier informal employment, and increases the earnings of those who remain as lower-tier informal workers, our results suggest that policies to increase the formal and vocational education of lower-tier informal workers (and to keep their children in school) is an effective policy for improving the livelihoods of lower-tier informal workers and their families.

II. Definitions and identification of the formal, upper tier informal and lower tier informal sectors

Following the ILO Thesaurus, our framework for identifying formal, upper-tier informal and lower-tier informal workers is based on whether or not regulations and mandatory labor protections are complied with. The formal sector complies with all registration requirements and labor protections, the upper-tier informal sector complies with some but not all regulations and worker protections, while the lower-tier informal sector does not comply with registration requirements or labor protections.

In addition to identifying whether workers belong to the formal or informal sectors, we also distinguish between wage employees and self-employed workers. That is, we separate workers into six sectors: formal self-employed, upper-tier informal self-employed, lower-tier informal self-employed; formal wage employees, upper-tier informal wage employees, and lower-tier informal wage employees.

A. Data

The data we use in this analysis are a panel data set of individuals constructed from the 2011 through 2018 annual Costa Rican National Household Surveys (*Encuesta Nacional de Hogares*, or ENAHO, in Spanish). The National Household Surveys are cross-sectional surveys that are conducted annually by the Costa Rican National Statistics and Census Institute. The ENAHO uses a rotating sample design whereby interviewers in one year return to approximately 75% of the households interviewed in the previous year. Interviewers record a code identifying the address of each dwelling surveyed, which allows them to track the same dwellings that are in consecutive surveys (i.e. dwellings surveyed in 2011 that are also surveyed in 2012). The Statistics Institute next checked that the same dwellings include the same households by comparing the personal characteristics of each household member (i.e. age, gender, education levels, etc.) for each consecutive year. Finally, using information on the personal characteristics of the each member of each household, the Statistics Institute was able to identify individuals within households and match individuals across consecutive years. Using this strategy, the Statistics Institute constructed seven year-to-year panel data sets of households and individuals (2011-2012, 2012-2013, 2013-2014, 2014-2013, 2015-2016, 2016-2017, and 2017-2018). In

addition to these 7 year-to-year panels (where individuals are matched across two consecutive years), the Statistics Institute also constructed additional panel data sets that follows the same individuals over three years. This is possible because some households are interviewed in three consecutive years from 2011-2014. The institute then constructs a set of two-year panels (which follow the same individuals from 2011 to 2013 and then from 2012 to 2014). Because 25% of households are replaced in the sample each year this implies that we will be able to follow, at most, 75% of households for one year and 50% of households for two years.[2]

We limit our sample to the working age population, ages 15 through 65. In the resulting samples, the sample for the year-to-year panel (following the same individuals over two years) is 77,813 and the sample for the 2-year panel (following the same individuals over three years) is 10,936 (Table 1). That is, in practice the Statistics Institute could identify 37% of all individuals in the entire ENAHO over two years (for the one-year-panel) and 5.3% of all individuals in the ENAHO over three years (for the two-year panel). To provide information on whether there is non-random attrition between the nationally representative ENAHO and the constructed panel data, Table 1 compares the characteristics of the sample of the original ENAHO surveys with the characteristics of the year-to-year panel that was constructed from the ENAHO surveys (see the first two columns in Table 1). Overall, the characteristics of the year-to-year panel are reasonably similar to those of the full ENAHO household sample. The proportion of males and females is similar, with a slightly higher proportion of women in the year-to-year panel. The average age in the year-to-year panel is slightly higher than in the cross-sectional ENAHO sample; this is reasonable as the individuals in the panel data will by construction be older than the cross-sectional ENAHO samples. The proportion of by each labor force status (employed, unemployed and out of the labor force) is a bit different between the cross-sectional ENAHO and the year-to-year panel. Specifically, the proportion of the sample who are not in the labor force is higher in the year-to-year panel; but this is again reasonable as the older individuals in the panel sample are more likely to be retired, and therefore out of the labor force. The proportion of self-employed workers and employees is similar in the entire ENAHO sample and the year-to-year panel (although the distribution of public and private employees is different). The distribution of the two samples by education is more problematic; for example, in the year-to-year panel sample 16% have university education compared to 19% in the entire ENAHO sample.

Next we compare characteristics of the year-to-year panel data sets with the panel that covers transitions over two years (compare columns 2 and 3 in Table 1). Overall, there is evidence from Table 1 that the characteristics of the two panel data sets differ, and therefore there may be non-random attrition between these two samples. For example, the average age in the two year panel is less than in the year-to-year panel, which is not as we expected. The distribution of education between the two panels also differs, with an increase in the proportion with a lower education level and an increase in the proportion with upper education levels. In summary, the sample from the two year panel is younger, less educated and more male than the year-to-year panel sample. It is likely that there is non-random attrition into the two-year panel, and one should be

[2] While it is possible to follow the same individuals for three years, the sample size of the resulting data set is too small for the analysis conducted in this paper.

skeptical interpreting result from the two-year panel, especially if they differ from the results from the year-to-year panel.

B. Identification of the formal, upper informal and lower informal sectors among wage employees.

In the ENAHO household surveys, wage employees are self-identified as "wage employees, unpaid assistants or private household workers" (including domestic servants). For private household workers the household (family) for whom they work is considered the employer. Wage employees also include unpaid employees in family enterprises. For simplicity, in the rest of this paper we also refer to "wage employees" as simply "employees." We will use the term "workers" when describing both wage employees and the self-employed.

Following the basic ILO definition, informal sector employees are those who are not regulated or protected by the existing legal or regulatory framework. The common operationalization of "not protected by the existing legal or regulatory framework" is whether or not the employer contributes to social security (through payroll taxes) for the employee. We follow this convention and identify formal employees as those whose employers contribute to social security for the worker. This operationalization makes sense in Costa Rica as social security (which provides both health care and pensions) is the most wide-spread and desired social protection, and payment of social security contributions is the most strongly enforced tax. Workers in the Costa Rican Social Security system (the *Caja Costarricense de Seguro Social*, or CCSS) are by definition registered with the government.

Social Security in Costa Rica is mandated for all workers, including employees and self-employed workers.[3] For employees, Social Security contributions total 23.67% of salary; employers contribute 14.33% and employees 9.34%. There is a minimum contribution, which is equivalent to the Social Security tax for a worker with the minimum wage.

Self-employed workers pay under a "special regime." The "special regime" is the way self-employed workers can contribute, and be affiliated, to the Social Security system in Costa Rica. This is needed because the "normal" way workers contribute to Social Security is through their employer, which self-employed workers do not have. As noted, by Costa Rican law all workers, including the self-employed, must contribute to Social Security. The self-employed must pay both the employer and employee contributions to Social Security. In addition, for wage employees, if the employer illegally does not pay the Social Security payroll tax then the employee can use the special regime to pay their own way into the Social Security system.[4]

[3] Public sector workers are also automatically included as formal sector employees. Most public sector workers are affiliated with the Social Security system. However, some public sector workers, such as teachers, are affiliated with an alternative pension system but have to contribute to the health insurance of the Social Security system and other mandatory payroll taxes

[4] However, low wage self-employed workers are subsidized by the government and therefore pay lower Social Security taxes. For example, workers earning less than 0.7885 the minimum wage pay 11.3% of their income into the Social Security system under the special regime, workers earning between 0.7885 and twice the minimum wage pay 11.30%, workers earning between twice and four times the minimum wage pay 12.28%, etc.). The maximum social security tax for those in the special regime is 18.62% of earnings. This graduated payment scale by income is

As noted, we identify formal employees as those whose employers contribute to social security for the worker. Employees who affiliate with Social Security through the special regime, and whose employers do not pay for Social Security, are not formal. We identify these workers as upper-tier informal workers.

There are other wage employees who we also identify as upper-tier informal because they are covered by Social Security but their employers do not pay their payroll taxes. For example, if the employee is a direct dependent of someone with Social Security. A few people also pay directly for private insurance, which covers private clinics and hospitals but not Social Security clinics and hospitals. In addition, Social Security is paid for entirely by the government for some poor individuals. It is likely that all of these employees voluntarily forego employer-subsidized Social Security in exchange for other forms of compensation such as higher wages. These workers are informal but are also clearly voluntary. We identify all employees whose employers do not pay Social Security contributions, but who are inscribed into the Social Security system, as upper-tier informal employees.

In Costa Rica, workers who voluntarily forgo employer subsidized Social Security may still be covered by other labor protections. Other labor protections in Costa Rica include: sick leave, paid vacations, an *aguinaldo* (mandated month salary as a bonus in December), overtime pay, worker compensation insurance, safety regulations and maternal benefits.[5] Our data include information on whether employees receive many of these other benefits. We identify as upper-tier informal employees whose employers do not contribute to Social Security but who receive paid sick leave, paid vacations, work risk insurance or the *aguinaldo*. We also include as upper-tier informal employees as those whose employers do not contribute to Social Security but who do have salary deductions for income taxes; that is, employees whose employers comply with some regulations and mandated worker protections but not all.

Professional and technical employees are likely to be able to move voluntarily between the informal and formal sectors, and are also identified as upper tier-informal employees.

Lower-tier informal employees are identified as those who are neither formal nor upper-tier informal employees. That is, lower-tier informal employees are those who receive no Social Security insurance or other labor protection benefits. These employees could be employees in a firm, work in a private household, work as an unpaid family member, whose wage is paid in kind, or in a single payment or per piece.

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designed to encourage all self-employed workers, including the poor, to become inscribed into the Social Security system.

[5] Inspections for violations of Social Security are generally carried out separately from violations of other worker protection legislation. Social Security inspectors can impose sanctions (including fines; up to closing down a firm). If a Social Security inspector finds a violation of any other part of the labor code they are not required to inform the Ministry of Labor. On the other hand, if a Ministry of Labor inspector finds a violation of Social Security legislation, they are required to inform the Social Security inspectors. In some cases of a full inspection there is coordination between agencies, and a joint inspection is carried out by Ministry of Labor, Social Security and Ministry of Health inspectors.

In summary, formal employees are defined as those whose employers contribute to Social Security or who are public sector employees. Upper-tier informal employees are defined as those whose employers do not contribute to Social Security BUT have Social Security health insurance as a dependent of a directly insured, in the "special regime," are insured by the state or private insurance, OR if the employee receives other mandated benefits such as paid annual leave, paid sick leave, work risk insurance, or *aguinaldo* (mandated one-month salary bonus in December), OR if income taxes are deducted from their salary, OR are professional or technical employees. Lower-tier informal employees are all other employees. That is lower-tier informal employees have no health insurance nor receive any other labor protection benefits.

C. Identification of the formal, upper tier informal and lower tier informal sectors among self-employed workers.

Self-employed workers are those who self-identify as own account workers or owners of firms (employers).

Self-employed workers in Costa Rica are legally required to be registered to both the *Caja Costarricense de Seguro Social* (CCSS) and the Ministry of Finance. Self-employed workers are also legally required to pay both the employer and employee contributions to Social Security through the "special regime," described above. Moreover, every private contractor is required to verify that the self-employed worker who is offering goods or services to the business is registered to both public institutions before hiring any of their services. Each entity, the CCSS and the Ministry of Finance (known as *Hacienda* in Costa Rica), is in charge of enforcing its own law and taxes, so it is possible for a self-employed worker to be registered with the CCSS but not registered with the Ministry of Finance (and vice-versa).

For self-employed workers to fully comply with the law in Costa Rica they must both pay into Social Security and be registered. We identify formal self-employed workers as those who follow all regulations: specifically, those who both contribute to Social Security AND are registered. Workers are identified as registered if they are registered in the National Records or other public institution[6] or keep formal accounts for reporting to the government.

Upper-tier informal self-employed are identified as those who comply with some but not all regulations. Specifically if they are registered OR receive some type of Social Security health insurance (including the special regime, as a direct dependent of an insured employee, insured by the government or have private insurance), but are not both registered and have Social Security. Even if they are neither registered nor pay Social Security, other self-employed workers are classified as upper-tier informal self-employed if they are in a profession that requires post-secondary or vocational education, if they are employers with at least one employee, or if their place of work has a fixed premises.

[6] Although the ENAHO does not inquire directly about being registered to the Ministry of Finance, it does inquiry about registration to national records –which is more common for bigger firms or employers- and any other public entity which would include the Ministry of Finance. Also, those keeping formal accounting books are likely to have them for taxes purposes.

Lower-tier informal self-employed are identified as those who do not comply with any mandated government regulations; specifically if they have no type of health insurance nor are registered, have no paid employees, and are not professional or technical workers. These include those whose place of work has no fixed premises (i.e. in the owner's dwelling, are itinerant, on construction sites or on agricultural plots)

Table 2 presents the percent of the total working age population in each sector. In Costa Rica the largest sector is formal wage employment, comprising approximately 31% of the working age population (and representing over 50% of all workers). Approximately 10% of the working age population are upper-tier informal employees, and approximately 3.5% are lower-tier informal employees. Less than 2% of the working age population are in lower-tier informal self-employed. Upper-tier informal self-employed are approximately 8% of the working age population, and approximately 14% of all workers. In the non-employment sectors, 24% of the working age population is out of the labor force, 5% are unemployed and 13% are full-time students.

Relative to most developing and Latin American countries, in Costa Rica the lower-tier informal sector is small, both as a percent of total employment, as a percent of wage employment, and as a percent of the informal sector. We estimate that 78% of all informal workers are in the upper-tier informal sector (employees or self-employed).

D. Average hourly wages, monthly earnings and family incomes by working sector

Table 3 presents average hourly wages, monthly earnings and hours worked by sector in 2018 2017 (in 2015 colones). While we present only one year of wage data in Table 3, the results are qualitatively similar for other years.

Hourly wages are highest for formal self-employed, next highest formal employees, then upper-tier informal self-employed, followed by upper-tier informal employees, and lowest for lower-tier informal self-employed and lower-tier informal employees.

For all types of formality and informality the estimated hourly wages of the self-employed are higher than the wages of employees. For example, the estimated wages of formal self-employed are higher than the wages of formal employees. This may be because self-employed "wages" include not only returns to labor, but also returns to capital and entrepreneurship. Therefore, it is likely that average wages cannot be directly compared between self-employees and wage employees. Later, we examine changes in wages when workers change sectors, which may suffer less from this measurement problem. Still, we are somewhat skeptical of any results that compare the wages of the self-employed and wage employees.

Monthly earnings exhibit the same relative ranking between sectors as hourly wages. One difference from hourly earnings is that the monthly earnings gap between the two formal sectors and the informal sectors is larger than for hourly earnings. This difference is due to more hours worked in the formal sectors vs. the informal sectors. Average hours worked for formal sector self-employed and employees are approximately equal to the legal work week in Costa Rica, 48

hours per week (8 hours per day for 6 days per week). Average hours worked in the two formal sectors are approximately 10 hours more per week than in the informal sectors.

These results suggest an ordering of sectors in terms of desirability. This ordering, from most desirable to least, is: (1) formal salaried employees and formal self-employed, (2) upper-tier informal self-employed, (3) upper-tier informal employees, and (4) lower-tier informal self-employed and lower-tier informal employees.

III. Are informal workers involuntarily or voluntarily in the informal sector?

In this section we provide evidence on the voluntary or involuntary nature of informality in Costa Rica. As noted in the introduction, the labor market segmentation theory of dualistic labor markets predicts that informal workers are involuntary. In this view, wages are institutionally set at higher than equilibrium (market) levels in the formal sector (i.e. Harris and Todaro, 1970; Fields, 1975), which leads to more workers looking for formal sector jobs than the limited number of jobs available; that is, a surplus of labor supply to the formal sector. Workers are in the informal sector involuntarily because they are not able to obtain one of the limited high-wage formal sector jobs. In the informal sector, where these institutional mechanisms do apply, wages are set at the equilibrium (market) level. Informal wages are also low because of the artificially high supply of labor because informal workers are limited in their ability to move to the formal sector. Labor market segmentation therefore causes a wage gap between identical formal and informal workers (that is, for workers with the same productivity).

Tests of segmented labor markets, therefore, have often used regression of earnings equations to compare wages for workers in different sectors who have similar observed personal and job characteristics. One criticism of these tests for segmentation is that wages could differ between sectors because workers choose sectors based on personal preferences or comparative advantage. That is, the earnings equation suffer from selection bias. Several studies have addressed this issue using the Heckman selection correction and instrumental variables (i.e. Guenther and Launov, 2006; Basch and Paredes-Molina, 1996; Gindling, 1991; Heckman and Hotz, 1986). Another way to address this issue is to use panel data to measure changes in earnings for those workers who move sectors, which allows the researcher to control for observed and unobserved differences in personal characteristics. We adopt the later strategy.

A. Changes in wages when workers change sectors: evidence of labor market segmentation

We use the panel nature of the data to examine if wages for the same workers increase or decrease when these workers change sectors. This allows us to control for unobserved and observed differences between workers. If wages for the same workers increase as they move from an informal to a formal sector, and wages for the same workers fall as they move from a formal to an informal sectors, this is evidence of labor market segmentation and that workers are in that informal sector involuntarily.

We adjust for changes in observable characteristics when workers change sectors with regression analysis of wage changes. Specifically, we estimate the following wage change equation for each origin sector (suppressing the subscript for individual observations):

$$(LnY_{t1} - LnY_{t0}) = B_0 + B_1*LnY_{t0} + B_2*X_{1,t0} + B_3*\Delta X_1 + B_4*X_{2,t0} + B_5*\Delta X_2 + B_6*X_{3,t0} + \sum_j B_{7j}*D_j + e \quad \text{(EQ1)}$$

Where $(\text{Ln } Y_{t1} - \ln Y_{t0})$ is the proportional change in wages between consecutive years t0 and t1 (alternatively, between t and t+1), $X_{1,t0}$ is a vector of human capital and other individual level variables at t0 (education, vocational training and fluency in English, plus age and sex), ΔX_1 is a vector of changes in human capital between times t0 and t1, $X_{2,t0}$ is a vector of family-level variables at time t0 (presence of a partner, number of children under 12 years old), ΔX_2 is a vector of changes in family variables, and $X_{3,t0}$ is a vector of public utilities that each individual has access to (sanitation and potable water). We also control for year and region fixed effects.

Dj are a set of dummy variables indicating if the worker changed sectors between times t0 andt1. The reference category in each wage change regression ($D_j=0$) is that the worker did not change sectors. For example, we estimate an equation using data on lower-tier informal employees at time t0. In this equation Dj=0 if a worker remains a lower-tier informal employee at time t1. The other dummy variables indicate if the worker transitioned from lower-tier informal employment to the other working sectors (formal employees, upper-tier informal employees, lower-tier informal self-employed, upper-tier informal self-employed and formal self-employed). The coefficients on each of these dummy variables measure the proportional change in the wages of workers who transition between lower-tier informal wage employment and another sector, relative to what that worker would receive if they had remained in lower-tier informal sector (and controlling for the independent variables described in the previous paragraph).

Changes in these adjusted hourly wages given changes in sectors are reported in Table 4. Again, evidence of labor market segmentation would be if wages increase when going from an informal sector to a formal sector, and decrease when going from a formal sector to an informal sector.

The evidence from the wage equations is consistent with labor market segmentation between formal employees vs. lower-tier informal employees. Wages increase when workers transition from formal employment into lower-tier informal employment and decrease when workers transition from lower-tier informal into formal employment. All wage changes are statistically significant at 1%.

Similarly, the wage change evidence is consistent with segmentation between upper-tier informal employees and lower-tier informal employees. Wages increase when workers transition from lower-tier informal employment into upper-tier informal employment, and decrease when workers transition from upper-informal employment into lower-tier informal employment. All wage changes are statistically significant at 1%. Again, this suggests that lower-tier informal employees are in that sector involuntarily.

However, the wage change evidence suggests that there is no labor market segmentation between formal employment and upper-tier informal employment. Wage changes are not statistically significant when workers transition between these two sectors. This evidence suggests that

employees who move from formal into upper-tier informal wage employment do so voluntarily, possibly to avoid Social Security and other payroll taxes or because they prefer to work less than full-time.

Within self-employment, the evidence suggests that there is no labor market segmentation between formal self-employment and upper-tier informal self-employment, and therefore that workers in upper-tier informal self-employment are able to move voluntarily between upper-tier informal and formal self-employment. There are no statistically significant wage changes when workers transition between upper-tier self-employment into formal self-employment, or vice-versa. The evidence regarding whether the lower-tier informal self-employed exists is mixed. Wages do increase significantly when workers transition from lower-tier informal to formal self-employment or upper-tier informal self-employment, but wages also increase when the flow of workers is in the opposite direction (and the change is statistically insignificant). Thus, there is partial evidence that lower-tier informal self-employed workers are also involuntarily informal.

As we noted, we must use caution in interpreting wage changes between wage employment and self-employment. Taken at face value, the evidence is not consistent with labor market segmentation between formal employment and formal self-employment. Wages do not change significantly when workers transition between these two types of formal employment. This suggests that workers voluntarily move from formal wage employment into formal self-employment, perhaps to become entrepreneurs or self-employed professionals or because they prefer to work less than full-time or a non-standard work schedule.

On the other hand, the evidence from wage changes is consistent with segmentation between formal employment vs. lower-tier and upper-tier informal self-employment. Wages increase when workers transition from formal employment into these two types of informal self-employment, and wages decrease when workers transition from these two types of informal self-employment into formal employment. All wage changes are statistically significant at the 1% level.

The evidence is also consistent with segmentation between upper-tier informal employed vs. lower-tier informal self-employment. Wage changes are in the expected directions and are statistically significant at 10%. The evidence is not consistent with segmentation between upper-informal employees vs. upper-informal self-employed; the direction of the wage changes are consistent with segmentation, but one of two wage changes are not statistically significant at 5%.

Although the evidence is consistent with segmentation between formal employment vs. upper-tier and lower-tier informal employment, and partially consistent with segmentation between upper-tier informal employment vs. upper-tier and lower-tier informal self-employment, we are reluctant to conclude that workers are in upper-tier and lower-tier informal self-employed involuntarily. This is because comparisons between the wages of employees and self-employed may not be appropriate because wages are not measured the same way for employees and self-employed, and because we find little evidence of statistically significant wage changes when self-employed workers transition between different types of self-employment.

In summary, the evidence from patterns of wage changes when workers change sectors suggests that lower-tier informal wage employees are involuntary informal because this sector is

segmented from formal and upper-tier informal employees. On the other hand, upper-tier informal employees are in that sector voluntarily and are not segmented from formal employment. The evidence is also consistent with no labor market segmentation between formal employment and formal self-employment, suggesting that workers are self-employed voluntarily. Within self-employment, the evidence suggests that workers are in the formal and upper-tier informal sectors are in each of these sectors voluntarily. Our evidence suggests that only lower-tier informal wage employees, and possibly lower-tier self-employed, are involuntarily informal. These results suggest that in our somewhat ad-hoc assignment of workers to different sectors is appropriate—we have been able to identify a voluntary informal sector and an involuntary informal sector. However, involuntary informal employees and self-employed are a small fraction of the labor force and of the informal sector in Costa Rica (less than 6% of the labor force and 15% of all informal workers).

Several studies of Latin American labor markets have concluded that there is no labor market segmentation between the formal and informal sectors (for example, Basch and Paredes-Molina, 1996; Bosch and Maloney, 2010; Maloney, 1999). These studies identify self-employed workers as the informal sector. Our results differ from these studies because we separate self-employed from employees and divide informal workers into upper- and lower-tiers. Consistent with the cited studies, our evidence suggests that workers are self-employed voluntarily. Similarly our evidence is consistent with upper-informal employees being in that sector voluntarily. However, we find evidence of labor market segmentation in that lower-tier informal employees are involuntarily in that sector.

B.(i) *Transition patterns; year-to-year transitions:*

Table 5 presents Pij, the proportion of those in each origin sector *i* in time *t* that transitions to another sector (*j*) or remain in sector *i* in year *t+1*. In addition to providing evidence on labor market segmentation, this will help us understand which of the sectors have the most mobility into the formal sectors and where to focus policies to promote the most transitions from lower wage sectors to higher wage sectors.

If, as the wage change evidence suggests, formal wage employees and upper-tier informal employees are segmented from lower-tier wage employment, then most students with higher levels of education will graduate to formal employment, upper-tier informal employment, or go into unemployment and out of the labor force to queue for a formal sector job. This is what we find.[7] Full-time students who leave school are most likely to move to formal salaried employment, upper-tier salaried employment, unemployment or out of the labor force. This evidence suggests that graduating students either obtain formal or upper-tier informal employment out of school, or they go into unemployment or out of the labor force to wait for formal or upper-informal wage employment to open up. Taken together, 87% of graduates enter one of these states, compared to 6% who enter any type of self-employment and 6% who enter lower-tier informal salaried employment. This is consistent with rationing of jobs in formal or

[7] Note that because our sample includes only those 16 years old or older, students who we identify as leaving full time students are mostly graduates from secondary school or higher education.

upper-tier informal wage employment, which is consistent with labor market segmentation between these two sectors vs. lower-tier informal employment.

If formal and upper-informal salaried employees are segmented from lower-tier informal employment, then we should also find that the unemployed will queue for formal or upper-informal employment rather than take lower-tier informal jobs. Table 4 shows that when the unemployed find jobs, most go into high wage formal employment (22%) and upper informal wage employment (11%), or they stay unemployed (23%), go back to school (9.8%) or leave the labor force (18.6%). Few go into lower-tier informal employment or lower-tier self-employment (7%). All together, this suggests that people are queuing for formal or upper-tier informal wage employment while they are unemployed.

If formal employment is segmented from lower-tier informal sectors, then once employees obtain formal employment they will be very reluctant to leave. Formal employees have the least mobility into other sectors: 86% stay as formal employees from year to year, compared to less than 50% who stay in any other sector from year-to-year. Most of the formal employees who do move out go into upper informal wage employment (26%), unemployment (22%) and out of the labor force (18.5%). This is consistent with unemployment and out of the labor force as a place where employees queue for formal sector employment or retire. Overall, 96% of formal sector employees either stay in the formal sector, go to unemployment while searching for another formal sector job, go into the upper-tier informal sector, or leave the labor force. Very few, less than 2%, transition to lower-tier informal work (either self-employed or employees). Similarly, most formal self-employed either stay (49%) or transition into upper-tier informal self-employed (35%). Very few, less than 2%, transition into either lower-tier informal employment or self-employment.

There is some mobility into higher paid sectors from lower tier informal wage employment; of lower-tier informal employees, 21% transition into upper-tier informal wage employment and 15% into formal employment from year-to-year. In addition, in over 38% of lower-tier informal self-employed transition to formal or upper-tier informal self-employed or wage employment. This suggests that there is scope for promoting transitions from the lower-tier informal sectors into higher paid upper-tier informal and formal sectors.

B(ii). Transition patterns—two-year transitions:

We also examine where individuals in each sector find themselves two years later (from t to t+2). Table 6 presents these two-year transitions between sectors.

The two year transitions reaffirm the result of the very high level of persistence among formal employees. 82% of formal employees remain formal employees two years later. Most of those who do leave formal employment become upper-tier informal employees or leave the labor force.

As noted, if formal and upper-informal employees are segmented from lower-tier informal employment, then we should find that the unemployed will queue for formal or upper-informal employment rather than take lower-tier informal jobs. Two years on, we should find that an

increasing proportion of those unemployed will have left unemployment and have found formal jobs. This is what we find. The proportion of those unemployed in time t who are in formal employment increases from 22.3% after one year to 26.0% after two years, while the proportion who remain unemployed decreases from 23% to 17%. These are the biggest differences between the year-to-year and two year transitions.

In summary, the two-year transitions provide additional evidence of labor market segmentation between formal and upper-tier informal employment vs. lower-tier informal employment.

C. Gunther and Launov (2012)

D. Maloney (1999) test for labor market segmentation

Maloney (1999) argues that even changes in earnings between sectors for the same workers does not address another limitation of earnings comparisons, unobserved differences in job characteristics (i.e. non-wage benefits, compensating differentials, etc.). Maloney (1999) suggests a different approach based on patterns of worker transitions between sectors. "The dualistic view predicts that some general patterns should emerge. If formal sector work is preferred to informal work, then workers will queue up for formal sector jobs and relinquish them only" if fired, the firm closes or they retire. Maloney (1999) argues that this suggests that dualism should be characterized by very low rates of formal sector turnover and a large flow of workers from the informal sector to the formal sector. That is, transitions from the informal sectors to the formal sectors should be more frequent than transitions from the formal to informal sectors.

Maloney (1999) and Bosch and Maloney (2010) present evidence that transitions are not consistent with a dualistic or segmented labor market between formal employment and self-employment in Argentina, Brazil and Mexico. However, Bosch and Maloney (2010) do find evidence that "informal salaried work may correspond more closely to the standard queueing view, especially for younger workers" (abstract). Specifically, these studies find that movements between self-employment and formal employment are of similar magnitude, and that it is not true that transitions from self-employment to formal employment are more frequent than in the opposite direction. Further, they find evidence that earnings fall for workers who transition from self-employment to formal employment, and vice-versa. On the other hand, Bosch and Maloney (2010) find that transitions from informal employees to formal employment are greater than transitions in the opposite direction, and that when informal employees move to the formal sector wages increase.

Gunther and Launov (2012) argue that examining transitions between working sectors, as in the Maloney (1999) paper, cannot distinguish segmentation from voluntary informality. They write that "panel data on work flows across sectors, available for some Latin American countries, would not help to identify involuntary and voluntary informal employment: If no work flow existed between the informal and formal sector this could be the result of entry barriers into the formal sector or because employees would not be better off in the formal sector and hence choose to stay within the informal sector" (footnote 2). Nevertheless, we believe that it is useful

to explore whether or not we can use this possibly flawed technique to reaffirm the results that we have developed in this paper.

Maloney (1999) argues that if labor market segmentation exists, then transitions from the informal sectors to the formal sectors should be more frequent than transitions from the formal to informal sectors. However, Maloney (1999) also argues that transitions as a proportion of the origin sector (i.e. those in Table 5) may not be good measures to examine labor market segmentation. Maloney (1999) notes that "in a random shuffling of workers Pij," the percent of worker in a sector that transition to another sector, "would clearly increase with the size of the terminal sector" (p.288). For example, the reason that we find a larger proportion of lower informal employees transitioning to formal employment compared to those who transition from formal to lower informal employment may be because the lower informal sector has a much smaller number of workers compared to formal employees. To address this issue we first examine the total number of transitions between sectors, and then use a measure of the frequency of transitions that takes into account both the size of the terminal sector and the size of the origin sector. We next look at the total number of transitions (Table 7).

The number of transitions from the following lower wage sectors to higher wage sectors are consistent with dualism/segmentation between these sectors: lower-tier informal wage employment vs. formal wage employment; lower-tier informal wage employment vs. upper-tier informal wage employment; and lower-tier informal self-employed vs. formal self-employed. For all of these pairs of sectors, the number of workers that transition between the higher wage (formal or upper informal) and lower wage sectors are smaller than the number of workers who transition between the lower and upper wage sectors, which is consistent with Maloney's (1999) evidence in favor of labor market segmentation.

Maloney (1999) also argues that it is also important to address the different sizes and separation rates from the initial sector. He derives a measure, Vij, that does this. Specifically, if Pij is the proportion of those initially in sector *i* who move to sector *j*, Pii is the proportion of those initially in sector *i* stay in sector *i*, Pjj is the proportion of those initially in sector *j* (the destination sector) who stay in sector *j*, and Pj is the proportion of individuals in sector *j* as a proportion of individuals in all sectors, then

$$Vij = (Pij/Pj)/[(1-Pii)(1-Pjj)] \qquad \text{(EQ 2)}$$

Maloney (1999) argues that Vij captures the "disposition" that a worker will transition from sector *i* to sector *j*. Vij will be large if it is more likely that an individual will transition from sector *i* to sector *j*. Vij will be small if it is not likely that an individual will transition from sector *i* to sector *j*. If there is segmentation/dualism, then Vij will be greater for transitions from the low wage sector to the high wage sector compared to transitions from the high wage to the low wage sector.

Table 8 presents the results. The results when comparing Vij across transitions are qualitatively the same as those when we compare the total number of transitions. Transitions, as measured by Vij, from the following lower wage sectors to higher wage sectors are consistent with dualism/segmentation between these sectors: lower-tier informal wage employment vs. formal

wage employment; lower-tier informal wage employment vs. upper-tier informal wage employment; and lower-tier informal self-employed vs. formal self-employed. Consistent with the evidence from wage changes, this evidence suggests that lower-tier informal wage employees, and possibly also lower-tier informal self-employed, are in those sectors involuntarily.

In summary, using the Maloney (1999) methodology we find, as did Maloney (1999) and Bosch and Maloney (2010), no evidence of segmentation between self-employment vs wage employment. However, we do find that the transitions from the lower-tier informal wage employment into formal wage employment and upper-tier wage employment are larger than the reverse transitions, evidence consistent with segmentation between lower-tier informal wage employment and the other two types of wage employment. This was not a finding in Bosch and Maloney (2010) because they did not divide the informal sectors into lower tier and upper tier. But it is consistent with our previous findings that those in lower-tier informal wage employment are in that sector involuntarily.

IV. Characteristics correlated with transitions from informal employment (transition equations)

To provide evidence on improving the work and livelihoods of informal workers, we next estimate three multinomial logit equations that examine the correlates of transitions between sectors, with a particular focus on transitions from the lower-tier informal into upper-tier informal wage employment, formal wage employment and formal self-employment; and upper-tier informal employment and self-employment into formal employment and formal self-employment. The multinomial logit technique allows us to consider multiple discrete options for the dependent variable, specifically transitions between multiple sectors. We estimate three equations where the sample in each is limited to a specific working sector (or sectors). For example, we first report the correlates of transitions out of lower-tier informal employees and self-employed into: formal salaried employment, upper-tier informal employment, formal self-employment, upper-tier informal self-employment, unemployment, out of the labor force and full-time students (although to save space, the coefficients for the non-working sectors are not reported in the following tables). We estimate three equations of the form (suppressing the individual subscript):

$$S_{ij} = B_0 + B_2*X_{1,t0} + B_3*\Delta X_1 + B_4*X_{2,t0} + B_5*\Delta X_2 + B_6*X_{3,t0} + e \qquad \text{(EQ 3)}$$

Where S_{ij} is a discrete variable that takes on values for transitions from sector i to sector j. i = lower-t informal employees plus self-employed, upper-tier informal employees or upper-tier informal self-employment. j takes on a different value for each sector that is not i. The reference category is remaining in sector i.

As noted, we estimate three multinomial equations. The first uses data for those who start in lower-tier informal employment or self-employment (j) and examines the correlates into formal employment, upper-tier informal employment, formal self-employment and upper-tier informal self-employment. The second uses data for those who start in upper-tier informal employment

(j) and examines the correlates into formal employment, upper-tier informal self-employment, formal self-employment, lower-tier informal employment and lower-tier informal self-employment. The third uses data for those who start in upper-tier informal self-employment (j) and examines the correlates into formal employment, upper-tier informal employment, formal self-employment, lower-tier informal employment and lower-tier informal self-employment. (Note that we combine lower-tier informal employees with lower-tier informal self-employed because of the low sample size of the lower-tier informal self-employment sector.)

The independent variables in the transition equations are the same as those in the wage transition equations. Specifically, $X_{1,t0}$ is a vector of human capital and other individual level variables at t0 (education, vocational training and fluency in English, plus age and sex), ΔX_1 is a vector of changes in human capital between times t0 and t1 $X_{2,t0}$ is a vector of family-level variables at time t0 (presence of a partner, number of children under 12 years old), ΔX_2 is a vector of changes in family variables, and $X_{3,t0}$ is a vector of public utilities that each individual has access to (sanitation and potable water). Finally, we also control for year and region fixed effects.

Table 9 presents the correlates of transitions out of lower-tier informal employment and self-employment (the lowest wage sectors) and into upper-tier informal and formal work. This table presents the most direct evidence on improving the work and livelihoods of lower-tier informal workers for those who begin as lower-tier informal workers at time t0. Higher levels of education increase the probability that lower-tier informal employees and self-employed will move into formal employment, formal self-employment and upper-tier informal self-employment. Vocational training has the same positive impact. This suggests that having skills, or human capital, is one way lower-tier informal workers can increase their chances of obtaining a rationed job as a formal sector worker.

The probability of transitioning out of lower-tier work and into formal and upper-tier informal self-employment depends on age (but not transitions into formal and upper-tier informal wage employment). The probability that a lower tier informal sector worker becomes a formal or upper-informal self-employment increases with age until the mid-40s (and then falls from the mid-40s to 64). This is consistent with the hypothesis that some successful self-employed workers first work as lower-tier informal employees. After gaining experience (and possibly savings) some of these lower-tier informal workers are able to move into the formal self-employment, where they earn higher wages, subscribe to Social Security and are registered.

Table 10 presents the correlates of transitions out of upper-tier informal employment. Our focus is on the transitions into formal work (columns 1 and 4). Once again, higher formal education levels increase the likelihood that upper-tier informal employees transition into both formal employment and formal self-employment. Non-formal education such as vocational education and learning English also have a positive influence on transitions to formal work.

Table 11 presents the correlates of transitions out of upper-tier informal self-employment. Age matters in the probability of transitioning from upper-tier self-employment to formal self-employment. This is consistent with the hypothesis that some successful self-employed workers first work as upper-tier informal self-employed, where they gain experience (and possibly savings) that allow them to transition into higher-wage formal self-employment. Higher education levels increase the chances of an upper-tier informal self-employed transitions to

formal self-employment, but is not a statistically significant correlate of transitions into formal wage employment.

In all transitions, family structure matters. Transitions into formal wage employment are more likely if the worker has a partner (i.e. spouse) or gains a partner. While transitions into lower-tier informal jobs are more likely for individuals who have more children or who have lost a partner. Transitions from the lower-tier informal sectors into upper-informal jobs are more likely if the worker has a partner, and less likely the more young children are in the household.

Access to public utilities (potable water and sanitation) is not a statistically significant correlate of any transitions out of lower-tier or upper-tier informal work.

V. Conclusions

Contrary to the traditional labor market segmentation view of dualistic labor markets, where workers are involuntarily in the informal sector, some recent literature from Latin America suggests that there is no segmentation between informal and formal workers. We hypothesize that this finding is because the informal sector is heterogeneous, where some informal workers are voluntarily in the informal sector and others are involuntarily in the informal sector. A key purpose of this paper is to identify the voluntary (or upper-tier) informal workers from involuntary (or lower-tier) informal workers. Using job characteristics we assign workers to a heterogeneous informal sector in Costa Rica. In addition to a formal sector, where workers have Social Security health insurance and labor protections and registration regulations are complied with, we identify an upper-tier informal sector, where some but not all labor protections and regulations are complied with, and a lower-tier informal sector, where no labor protections or regulations are enforced or complied with. We further distinguish between self-employed workers and wage and salaried employees. Then we present evidence on whether each type of informal worker are in those informal sectors voluntarily or involuntarily.

Our evidence suggests that workers are voluntarily in the upper-tier informal wage employment, formal self-employment and upper-tier informal self-employment, but that workers are involuntarily in the lower-tier informal sectors. Our results imply that the involuntary informal sector in Costa Rica is small. Only 3% of the working age population (representing only 6.3% of workers and 15% of informal workers) are in involuntary lower-informal wage employment.

In the last section of the paper we estimate sector transition equations to examine the characteristics of workers who are more likely to transition into higher-paying sectors. We find that having more education, both formal education and vocational training, increases the probability that a lower-tier informal sector worker will transition into formal sector wage employment, upper-tier informal wage employment, formal self-employment and upper-tier informal self-employment. We also find evidence that some lower-tier informal employees and upper-tier informal self-employed are more likely to enter formal self-employment after gaining experience in those two informal sectors.

Further, more human capital is also the most significant identifiable factor that contributes to increased earnings for those who remain in the lower tier informal sectors. Human capital, both formal and vocational, also promote wage growth in formal sector wage employment. These

results suggest that promoting education for both children and working adults is an effective policy to improve the livelihoods of lower informal sector workers, as well as all other workers. Although we do not have variables that measure other types of human capital, such as health or access to health clinics, the results that increased human capital improves the livelihoods of informal workers suggests that promoting these other types of human capital may also have positive impacts.

One limitation of our analysis is that the definition and measurement of the size of the upper-tier and lower-tier informal sectors is ad-hoc. Although we present evidence that our ad-hoc classification does a reasonable job of capturing which workers are voluntarily or involuntarily informal, it may be more convincing to allow the data to endogenously determine the size of the voluntary and involuntary informal sectors. In the next step in this research we will attempt to do this using the methodology developed in Gunther and Launov (2012).

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Table 1: Descriptive statistics of panel sample, compared to the total National Household Survey (ENAHO) sample, 2011-2018 mean

Percent of working age population with each characteristic	**ENAHO**	**1yr PANEL**	**2yr PANEL**
Total sample size	**207,815**	**77,813**	**10,936**
% female	51.2	52.0	52.7
% male	48.8	48.0	47.3
Age groups (%)			
15 – 25	2.6	2.9	2.9
26 – 35	48.1	44.7	43.6
36 - 45	18.8	19.8	21.2
46 - 55	17.9	20.0	21.7
56 - 65	12.5	12.7	10.6
Average age	36.5	37.2	34.4
Education (%)			
none or incomplete primary	13.4	13.3	14.4
complete primary	51.8	52.9	55.2
complete secondary	16.1	15.7	14.4
some tertiary or Post-Graduate	18.6	16.1	15.9
Employer			
Self-employed	13.2	13.6	13.9
Private employee	36.4	35.0	32.8
Public employee	8.7	9.1	9.5
Labor force status			
Employed	58.4	57.7	56.2
Unemployed	5.3	4.9	4.4
Out of labor force	36.3	37.4	39.3

Table 2: Proportion of the total working age population in the panel data in each sector, 2011-2018 means

Sector	1yr PANEL	2yr PANEL
Formal self-employed	3.1%	3.7%
Upper-tier informal self-employed	7.9%	8.6%
Lower-tier informal self-employed	1.8%	1.6%
Formal wage employees	30.4%	28.4%
Upper-tier informal wage employees	10.6%	10.9%
Lower-tier informal wage employees	3.6%	3.1%
Full-time students	13.4%	13.2%
Unemployed	5.0%	4.4%
Out of the labor force	24.1%	26.1%

Table 3: Average hourly wages, monthly earnings, and household incomes, by sector, 2018 (in constant 2015 colones)

Sector	Hourly wage[1]	Monthly earnings[2]	Hours worked[3]
1-Formal Self-Employed	3,813	607,707	50
2-Upper- tier Informal Self-Employed	2,447	342,442	40
3- Lower-tier Informal Self-Employed	1,650	193,328	42
4-Formal Wage Employees	3,195	562,015	49
5-Upper-tier Informal Wage Employees	2,046	254,644	38
6-Lower-tier Informal Wage Employees	1,399	168,755	34

1. Worker Average Monthly Net Income from Main Job
2. Worker Average Monthly Net Income from Main Job
3. Average Weekly Hours Worked in Main Job

Table 4: Adjusted[1] hourly wage changes associated with transitions between working sectors
(heteroskedasticithy robust standard errors in parentheses)
Wage changes are relative to the wage change if workers stay in the same sector in both time t and t+1

2011-2018	1-Formal Self-Employed (t+1)	2-Upper-tier Informal Self-Employed (t+1)	3- Lower-tier Informal Self-Employed (t+1)	4-Formal Wage Employee (t+1)	5-Upper-tier Informal Wage Employee (t+1)	6-Lower-tier Informal Wage Employee (t+1)
1-Formal Self-Employed (t)		-0.085	0.216	-0.112	-0.207**	0.048
		-0.062	-0.309	-0.091	-0.083	-0.186
2-Upper-tier Informal Self-Employed (t)	0.044		0.009	0.168***	0.121**	0.089
	-0.052		-0.078	-0.058	-0.059	-0.133
3- Lower-tier Informal Self-Employed (t)	0.516***	0.149*		0.394***	0.246*	0.236**
	-0.199	-0.083		-0.102	-0.140	-0.118
4-Formal Wage Employee (t)	-0.193*	-0.269***	-0.282***		-0.029	-0.133***
	-0.102	-0.063	-0.089		-0.023	-0.047
5-Upper- tier Informal Wage Employee (t)	0.004	-0.073	-0.292**	-0.002		-0.109***
	-0.081	-0.050	-0.117	-0.023		-0.037
6-Lower-tier Informal Wage Employee (t)	-0.168	0.057	-0.130	0.136***	0.137***	
	-0.396	-0.141	-0.092	-0.048	-0.047	

Notes: [1]OLS regressions include the following controls: log of wage at time t, -lagged wage-, age and its square, sex dummy, Central Valley dummy, primary, secondary and tertiary education dummies for time t, the change in these dummies between time t and t+1, dummy for non-formal (vocational) education in time t, the change in this dummy from time t to t+1, fluency in English at time t, change in fluency between t and t+1, and year dummies.
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Transition probabilities (%) between sectors (standard errors in parenthesis)

2011-2018	1-Formal Self-Employed	2-Upper-tier Informal Self-Employed	3-Lower-tier Informal Self-Employed	4-Formal Wage Employees	5-Upper-tier Informal Wage Employees	6-Lower-tier Infomal Wage Employees	7- Full-Time Students	8- Unemployed	9- Out of the labor force	**Total**
1-Formal Self-Employed	48.5	34.6	1.0	3.5	6.8	0.6	0.2	1.1	3.8	100
	(1.0)	(0.6)	(0.3)	(0.1)	(0.3)	(0.1)	(0.0)	(0.2)	(0.1)	
2-Upper-tier Informal Self-Employed	12.6	45.1	4.1	5.0	10.3	1.8	1.7	2.5	17.0	100
	(0.7)	(0.6)	(0.5)	(0.1)	(0.3)	(0.3)	(0.1)	(0.2)	(0.3)	
3-Lower-tier Informal Self-Employed	2.3	21.1	33.7	6.8	8.1	11.0	1.5	4.9	10.5	100
	(0.3)	(0.5)	(1.3)	(0.2)	(0.3)	(0.6)	(0.1)	(0.3)	(0.2)	
4-Formal Wage Employees	0.4	1.4	0.5	86.5	3.5	1.5	0.7	3.0	2.5	100
	(0.1)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.1)	(0.3)	(0.1)	
5-Upper-tier Informal Wage Employees	2.2	8.4	1.3	12.7	42.4	5.9	5.3	5.4	16.5	100
	(0.3)	(0.4)	(0.3)	(0.2)	(0.6)	(0.5)	(0.2)	(0.4)	(0.3)	
6-Lower-tier Informal Wage Employees	0.6	4.5	5.8	15.2	20.7	27.9	4.3	9.9	11.2	100
	(0.2)	(0.3)	(0.6)	(0.2)	(0.5)	(0.9)	(0.2)	(0.5)	(0.2)	
7- Full-Time Students	0.1	1.5	0.4	5.6	5.5	1.9	69.2	7.0	8.7	100
	(0.1)	(0.2)	(0.2)	(0.1)	(0.3)	(0.3)	(0.5)	(0.4)	(0.2)	
8- Unemployed	0.6	4.7	2.4	22.3	11.0	7.9	9.8	22.8	18.6	100
	(0.2)	(0.3)	(0.4)	(0.3)	(0.4)	(0.5)	(0.3)	(0.7)	(0.3)	
9- Out of the labor force	0.3	5.1	0.7	2.1	7.1	1.7	3.3	3.8	75.9	100
	(0.1)	(0.3)	(0.2)	(0.1)	(0.3)	(0.3)	(0.2)	(0.3)	(0.3)	
Total percent of working age population in each sector in t+1	3.0	8.1	1.8	31.2	10.5	3.5	11.9	5.1	25.0	100
	(0.4)	(0.3)	(0.4)	(0.3)	(0.3)	(0.4)	(0.3)	(0.4)	(0.3)	

Table 6: Two-year Transition probabilities (%) between sectors (Pij)
(standard errors in parenthesis)

2011 - 2013 or 2012-2014	1-Formal Self-Employed	2-Upper-tier Informal Self-Employed	3-Lower-tier Informal Self-Employed	4-Formal Wage Employees	5-Upper-tier Informal Wage Employees	6-Lower-tier Infomal Wage Employees	7- Full-Time Students	8- Unemployed	9- Out of the labor force	**Total**
1-Formal Self-Employed	20.4 (3.1)	60.1 (1.4)	2.2 (1.1)	3.5 (0.3)	8.0 (0.8)	0.2 (0.3)	0.2 (0.2)	1.5 (0.5)	3.7 (0.3)	100
2-Upper-tier Informal Self-Employed	5.2 (1.7)	46.9 (1.4)	4.1 (1.4)	5.2 (0.4)	11.5 (0.9)	2.8 (0.8)	1.5 (0.4)	3.7 (0.8)	19.1 (0.7)	100
3-Lower-tier Informal Self-Employed	1.1 (0.8)	25.3 (1.3)	34.5 (3.4)	9.2 (0.5)	6.3 (0.7)	10.9 (1.6)	0.6 (0.2)	5.2 (0.9)	6.9 (0.5)	100
4-Formal Wage Employees	0.4 (0.5)	2.9 (0.5)	0.7 (0.6)	82.0 (0.7)	4.7 (0.6)	1.9 (0.7)	0.8 (0.3)	2.7 (0.7)	3.9 (0.4)	100
5-Upper-tier Informal Wage Employees	1.0 (0.8)	10.5 (0.9)	1.1 (0.7)	14.2 (0.6)	39.7 (1.4)	6.5 (1.3)	4.3 (0.6)	5.2 (0.9)	17.6 (0.7)	100
6-Lower-tier Informal Wage Employees	0.0 0.0	4.7 (0.6)	6.5 (1.8)	15.9 (0.6)	24.2 (1.2)	23.3 (2.2)	4.4 (0.6)	8.0 (1.1)	13.0 (0.6)	100
7- Full-Time Students	0.0 0.0	1.7 (0.4)	0.4 (0.5)	9.6 (0.5)	6.8 (0.7)	2.6 (0.8)	59.0 (1.5)	9.9 (1.3)	10.0 (0.5)	100
8- Unemployed	0.6 (0.6)	5.4 (0.7)	1.2 (0.8)	26.0 (0.8)	10.9 (0.9)	8.7 (1.4)	10.7 (0.9)	17.1 (1.6)	19.4 (0.7)	100
9- Out of the labor force	0.2 (0.3)	6.4 (0.7)	0.6 (0.6)	2.1 (0.3)	7.3 (0.7)	1.4 (0.6)	2.7 (0.5)	3.9 (0.8)	75.4 (0.8)	100
Total percent of working age population in each sector in *t+2*	3.0 (1.3)	8.1 (0.8)	1.8 (1.0)	31.2 (0.8)	10.5 (0.9)	3.5 (0.9)	11.9 (1.0)	5.1 (0.9)	25.0 (0.8)	100

Note: this table presents the probabilities of finding an individual in status j at time t+k conditional on being in status i at time t.

Table 7: The number of individuals in the sample who transition between sectors from year-to-year, 2011-2018 mean

2011 - 2018	1-Formal Self-Employed	2-Upper-tier Informal Self-Employed	3-Lower-tier Informal Self-Employed	4-Formal Wage Employees	5-Upper-tier Informal Wage Employees	6-Lower-tier Infomal Wage Employees	7- Full-Time Students	8-Unemployed	9- Out of the labor force	**Total in t**
1-Formal Self-Employed	1120	799	24	82	156	13	5	25	87	2311
2-Upper-tier Informal Self-Employed	754	2697	247	300	615	105	100	147	1016	5981
3- Lower-tier Informal Self-Employed	32	290	463	93	112	151	21	68	145	1375
4-Formal Wage Employment	89	336	112	20107	812	340	170	694	576	23236
5-Upper-tier Informal Wage Employment	179	679	104	1024	3428	478	428	433	1332	8085
6-Lower-tier Informal Wage Employment	16	123	159	415	567	762	117	270	305	2734
7- Full-Time Students	9	160	41	589	580	198	7243	738	915	10473
8- Unemployed	22	175	91	837	414	298	368	855	698	3758
9- Out of the labor force	60	940	128	383	1305	320	612	702	14004	18454
Total in t+1	2281	6199	1369	23830	7989	2665	9064	3932	19078	76407

Table 8: The disposition that a worker will transition from sector i to sector j (Vij from Maloney, 1999)

2011-2018	1-Formal Self-Employed	2-Upper-tier Informal Self-Employed	3-Lower-tier Informal Self-Employed	4-Formal Wage Employees	5-Upper-tier Informal Wage Employees	6-Lower-tier Infomal Wage Employees	7- Full-Time Students	8-Unemployed	9- Out of the labor force
1-Formal Self-Employed		1,506	170	164	217	43	11	53	121
2-Upper-tier Informal Self-Employed	1492		633	218	311	127	83	113	514
3- Lower-tier Informal Self-Employed	228	714		243	204	658	63	188	264
4-Formal Wage Employment	185	241	301		431	432	148	558	306
5-Upper-tier Informal Wage Employment	1404	327	188	524		408	154	143	475
6-Lower-tier Informal Wage Employment	53	140	678	501	477		162	344	257
7- Full-Time Students	18	111	107	434	298	244		575	470
8- Unemployed	49	135	264	687	237	408	346		399
9- Out of the labor force	88	474	242	205	487	286	376	397	

Table 9: Estimation of the characteristics correlated with transitions from the lower-tier informal sectors (self-employed and employee) into the formal and upper-tier informal sectors

	TRANSITIONS FROM THE LOWER TIER INFORMAL SECTORS			
INDEPENDENT VARIABLES (marginal probabilities are reported, standard errors in parenthese)	To formal self-employed	To upper-tier informal self-employed	To formal wage employee	To upper-tier informal wage employee
Age	0.00264**	0.0116***	0.000356	0.000795
	(0.00107)	(0.00288)	(0.00321)	(0.00333)
Age2	-2.76e-05**	-0.000107***	-5.63e-05	-2.04e-05
	(1.27e-05)	(3.59e-05)	(4.36e-05)	(4.35e-05)
Female	-0.0124**	0.00126	-0.0459***	0.0563***
	(0.00560)	(0.0114)	(0.0134)	(0.0139)
Complete Primary Education	0.00747	0.0238*	0.0449**	-0.00848
	(0.00619)	(0.0141)	(0.0178)	(0.0173)
Complete Secondary (academic and technical)	0.0160**	0.0527***	0.0981***	0.00334
	(0.00784)	(0.0201)	(0.0223)	(0.0250)
Some Tertiary and Post-Graduate	0.0257***	0.0715***	0.108***	-0.0333
	(0.00860)	(0.0252)	(0.0284)	(0.0366)
Earn a primary education degree	0.00401	0.0382	0.0186	0.0655*
	(0.0130)	(0.0273)	(0.0375)	(0.0335)
Earn a secondary education degree	0.0260***	0.0274	0.0173	-0.0898
	(0.00724)	(0.0370)	(0.0378)	(0.0600)
Earn some tertiary education	0.00524	0.0662*	-0.0618	0.0457
	(0.0138)	(0.0393)	(0.0617)	(0.0635)
Non-formal vocational education	0.00254	0.0173	0.0426***	-0.0158
	(0.00484)	(0.0135)	(0.0139)	(0.0175)
Earn vocational education	0.00769	0.0358**	0.0570***	0.0287
	(0.00561)	(0.0174)	(0.0188)	(0.0225)
Fluency in English	0.00745	0.0272	-0.0413	-0.0908*
	(0.00609)	(0.0266)	(0.0330)	(0.0476)
Increase fluency in English	0.00696	0.00862	0.0344	0.0540
	(0.0146)	(0.0484)	(0.0461)	(0.0584)
Presence of a partner	0.0106**	0.0592***	0.0429***	-0.0110
	(0.00435)	(0.0119)	(0.0138)	(0.0149)
Gain a partner	0.0123	0.0445	0.0526**	-0.0788**
	(0.01000)	(0.0288)	(0.0266)	(0.0398)
Lose a partner	-0.181***	-0.0266	0.0206	-0.0291
	(0.0277)	(0.0338)	(0.0353)	(0.0448)
Number of children under 12yrs old in household	-0.00136	-0.0100*	-0.0119*	0.00194
	(0.00189)	(0.00550)	(0.00692)	(0.00656)
Change of children under 12	-0.00693*	-0.00132	-0.00308	0.00192
	(0.00382)	(0.00811)	(0.00941)	(0.0110)
Potable water	-0.00401	-0.0155	-0.0239	0.00985
	(0.00567)	(0.0167)	(0.0177)	(0.0218)
Publicly provided sanitation system	0.000691	0.0139	0.00159	-0.0371*
	(0.00515)	(0.0140)	(0.0165)	(0.0193)
Central Valley	-0.00388	0.00286	0.000519	0.0434***
	(0.00386)	(0.0104)	(0.0117)	(0.0132)
Time dummies	Yes	Yes	Yes	Yes
Observations	3,480	3,480	3,480	3,480

Standard errors in parentheses. Results for transitions into unemployment, full-time student and out of the labor force are on included in this table.

*** p<0.01, ** p<0.05, * p<0.1

Note: Lower tier informal sectors include lower informal self-employed and wage employees

Table 10: Estimation of the characteristics correlated with transitions from upper-tier infomal wage employment

	TRANSITIONS FROM THE UPPER-INFORMAL WAGE EMPLOYMENT				
INDEPENDENT VARIABLES (marginal probabilities are reported, standard errors in parenthese)	To formal self-employed	To upper-tier informal self-employed	To lower-tier informal self-employed	To formal wage employee	To lower-tier informal wage employee
Age	0.00503***	0.00919***	0.00317***	0.00858***	0.00111
	(0.00110)	(0.00189)	(0.000814)	(0.00209)	(0.00130)
Age2	-5.61e-05***	-8.69e-05***	-3.72e-05***	-0.000134***	-2.65e-05
	(1.34e-05)	(2.29e-05)	(1.02e-05)	(2.77e-05)	(1.76e-05)
Female	-0.0282***	-0.0561***	-0.0137***	-0.0839***	-0.0486***
	(0.00424)	(0.00677)	(0.00319)	(0.00813)	(0.00635)
Complete Primary Education	0.0329***	0.00567	0.00156	0.00282	-0.00550
	(0.0105)	(0.00965)	(0.00424)	(0.0132)	(0.00830)
Complete Secondary (academic and technical)	0.0453***	0.0166	0.00785	0.0669***	-0.0121
	(0.0116)	(0.0137)	(0.00547)	(0.0164)	(0.0121)
Some Tertiary and Post-Graduate	0.0625***	0.0186	-0.00485	0.0805***	-0.0598***
	(0.0118)	(0.0154)	(0.00695)	(0.0177)	(0.0180)
Earn a primary education degree	0.0396***	-0.00955	-0.173***	0.0386	0.0228
	(0.0146)	(0.0246)	(0.0195)	(0.0284)	(0.0175)
Earn a secondary education degree	0.00530	0.0234	0.000761	0.0249	-0.0368*
	(0.0120)	(0.0220)	(0.00970)	(0.0240)	(0.0203)
Earn some tertiary education	0.00879	-0.00116	-0.00904	0.0332	-0.0328
	(0.0110)	(0.0298)	(0.0132)	(0.0257)	(0.0283)
Non-formal vocational education	0.00474	0.0297***	-0.000538	0.00364	-0.00463
	(0.00433)	(0.00787)	(0.00353)	(0.00999)	(0.00757)
Earn vocational education	0.0140***	0.0237**	-0.00276	0.0183	-0.0169
	(0.00490)	(0.0107)	(0.00501)	(0.0125)	(0.0110)
Fluency in English	0.00371	0.0186	-0.00486	0.0567***	-0.0485**
	(0.00641)	(0.0177)	(0.00870)	(0.0174)	(0.0247)
Increase fluency in English	0.00737	-0.0101	0.00641	0.0634***	-0.00330
	(0.00843)	(0.0296)	(0.00959)	(0.0238)	(0.0255)
Presence of a partner	0.0116***	0.0328***	-0.00730**	-0.00377	-0.0446***
	(0.00445)	(0.00813)	(0.00317)	(0.00962)	(0.00715)
Gain a partner	0.00295	0.0182	-0.0123	0.0197	-0.0175
	(0.0132)	(0.0233)	(0.0132)	(0.0256)	(0.0184)
Lose a partner	-0.0231	-0.0216	0.0117*	0.0307	0.0568***
	(0.0203)	(0.0236)	(0.00705)	(0.0265)	(0.0153)
Number of children under 12yrs old in household	-0.000396	0.00526	0.00247*	0.00263	0.00787***
	(0.00201)	(0.00379)	(0.00146)	(0.00491)	(0.00304)
Change of children under 12	0.00334	-0.00693	0.000412	-7.18e-05	-0.000812
	(0.00353)	(0.00613)	(0.00297)	(0.00813)	(0.00629)
Potable water	0.000276	-0.00214	0.00551	0.00922	0.0212**
	(0.00645)	(0.0111)	(0.00584)	(0.0144)	(0.0103)
Publicly provided sanitation system	-0.00877	-0.0102	0.00226	0.00728	-0.0105
	(0.00590)	(0.0102)	(0.00391)	(0.0114)	(0.00905)
Central Valley	-0.00545	-0.00522	0.000606	0.0177**	-0.00451
	(0.00362)	(0.00681)	(0.00288)	(0.00825)	(0.00574)
Time dummies	Yes	Yes	Yes	Yes	Yes
Observations	6,790	6,790	6,790	6,790	6,790

Standard errors in parentheses. Results for transitions into unemployment, full-time student and out of the labor force are on included in this table.

*** p<0.01, ** p<0.05, * p<0.1

Table 11: Estimation of the characteristics of transitions from upper-tier infomal self-employment

	TRANSITIONS FROM THE UPPER TIER INFORMAL SELF-EMPLOYMENT				
INDEPENDENT VARIABLES (marginal probabilities are reported, standard errors in parenthese)	To formal self-employed	To lower-tier informal self-employed	To formal wage employee	To upper-tier informal wage employee	To lower-tier informal wage employee
Age	0.0147***	0.00516***	0.00282	-0.00477*	-0.000328
	(0.00302)	(0.00169)	(0.00174)	(0.00255)	(0.000922)
Age2	-0.000164***	-6.50e-05***	-6.04e-05***	3.32e-05	-4.90e-06
	(3.38e-05)	(1.98e-05)	(2.15e-05)	(3.01e-05)	(1.16e-05)
Female	-0.146***	-0.0295***	-0.0273***	-0.0169**	-0.0162***
	(0.0101)	(0.00572)	(0.00578)	(0.00806)	(0.00445)
Complete Primary Education	0.0583***	-0.00778	-0.00469	-0.0227*	-0.00484
	(0.0160)	(0.00841)	(0.0110)	(0.0130)	(0.00541)
Complete Secondary (academic and technical)	0.0685***	-0.0115	0.00142	-0.000526	-0.00176
	(0.0195)	(0.0115)	(0.0129)	(0.0160)	(0.00679)
Some Tertiary and Post-Graduate	0.126***	-0.0134	0.0176	-0.0742***	-0.0274***
	(0.0194)	(0.0119)	(0.0129)	(0.0197)	(0.0104)
Earn a primary education degree	0.0123	0.00819	-0.0353	-0.00896	-0.0163
	(0.0388)	(0.0176)	(0.0337)	(0.0282)	(0.0163)
Earn a secondary education degree	0.0231	0.0250	0.0302*	-0.0252	-0.00120
	(0.0319)	(0.0168)	(0.0168)	(0.0353)	(0.0125)
Earn some tertiary education	0.0987***	0.0236	0.0206	-0.0385	-0.229***
	(0.0316)	(0.0248)	(0.0242)	(0.0491)	(0.0254)
Non-formal vocational education	0.0156	-0.000286	-0.00760	-0.0167*	-0.00842*
	(0.0100)	(0.00648)	(0.00681)	(0.00974)	(0.00434)
Earn vocational education	0.0466***	0.00508	0.00930	-0.0261*	-0.0210**
	(0.0132)	(0.00900)	(0.00899)	(0.0153)	(0.00962)
Fluency in English	-0.00488	-0.0205	0.0266***	0.00156	0.00684
	(0.0174)	(0.0153)	(0.00976)	(0.0213)	(0.00785)
Increase fluency in English	0.0102	0.0190	0.0239	-0.0218	-0.00663
	(0.0290)	(0.0176)	(0.0162)	(0.0386)	(0.0160)
Presence of a partner	0.0110	-0.0255***	-0.00992	-0.0265***	-0.0158***
	(0.0115)	(0.00672)	(0.00759)	(0.0103)	(0.00467)
Gain a partner	0.0887**	0.00895	0.0429**	0.0674**	-0.00409
	(0.0412)	(0.0213)	(0.0201)	(0.0310)	(0.0157)
Lose a partner	-0.00498	0.0285	0.00955	0.0613**	0.0111
	(0.0350)	(0.0174)	(0.0213)	(0.0244)	(0.0120)
Number of children under 12yrs old in househol	-0.00329	0.00510	-0.00291	0.00167	0.00121
	(0.00595)	(0.00362)	(0.00452)	(0.00586)	(0.00294)
Change of children under 12	-0.00225	0.0128**	0.00759	-0.00242	0.00283
	(0.00999)	(0.00607)	(0.00796)	(0.00916)	(0.00355)
Potable water	-0.000632	0.0174*	0.0115	0.00612	0.00187
	(0.0144)	(0.00999)	(0.0118)	(0.0139)	(0.00577)
Publicly provided sanitation system	-0.0189	-0.00753	0.0108	0.00192	-0.000983
	(0.0128)	(0.00867)	(0.00763)	(0.0123)	(0.00556)
Central Valley	-0.00561	-0.00184	0.0103*	0.00206	-0.000121
	(0.00929)	(0.00599)	(0.00626)	(0.00889)	(0.00396)
Time dummies	Yes	Yes	Yes	Yes	Yes
Observations	5,178	5,178	5,178	5,178	5,178

Standard errors in parentheses. Results for transitions into unemployment, full-time student and out of the labor force are on included in this table.

*** p<0.01, ** p<0.05, * p<0.1