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Time Deficits and the Measurement of Income Poverty:
Methodology and Evidence from Latin America

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Abstract

We argue that the use of conventional income or consumption poverty thresholds in evaluations of poverty is internally inconsistent when at least some households suffer from time deficits related to household production that they cannot compensate via purchases of market substitutes. We also argue that the use of conventional thresholds under such a scenario is fundamentally inequitable toward households with time deficits. Building on the approach originally outlined by Claire Vickery, we develop a measurement framework that can overcome the inconsistency and inequity problems inherent in the use of conventional thresholds. Unlike the earlier work in this area, we explicitly incorporate intrahousehold disparities in the division of housework. We supplement our measurement framework with a microsimulation model that sheds light on the effectiveness of full-time employment to reduce income poverty when time deficits are taken into account. Our empirical findings for Argentina (Buenos Aires), Chile (Greater Santiago) and Mexico indicate that the rate of income poverty using our measure is dramatically higher than the official rate for households: 6 vs. 11 percent in Argentina; 11 vs. 18 percent in Chile; and, 41 vs. 50 percent in Mexico. We also find that while full-time employment for every employable adult reduces income poverty by either measure drastically, our measure shows that 6, 11 and 39 percent of households in Argentina, Chile and Mexico would still remain income-poor.

1 Introduction

Absolute poverty lines are supposed to reflect the command over a minimal set of goods and services that are necessary for survival. Admittedly, most low-income people attain an income that is at least sufficient to acquire the minimum level of consumption by allocating time toward employment, though a substantial proportion of the income-poor are employed. The existing time use surveys confirm the commonsense notion that, on the average, individuals also allocate a considerable amount of time toward unpaid household production activities in order to provide services such as meals and childcare to members of their household. While there are pronounced differences among individuals in the time spent on household production along various dimensions, particularly that of gender, marital status, age, labor force status and income, it seems reasonable to suppose that a certain minimum quantity of time must be devoted to household production for the typical household to reproduce itself as a unit. However, this requirement, which evidently must also apply to low-income households, is not taken into account explicitly or fully in standard income or consumption poverty lines.

It is imperative to take the time requirement for household production explicitly into account because some households may not be able to meet that requirement *and* may not have sufficient income to purchase the requisite market substitutes for the services supplied by household production. For such households, the standard income or consumption poverty lines do not represent the same command over goods and services as those not constrained by time and income in this way. The neglect of the time requirement renders the use of the standard poverty line internally inconsistent in the sense that the thresholds presuppose the time requirement but the definition of resources ignores time.[1]

Apart from their significance for constructing coherent income or consumption poverty measures, time deficits are important in their own right. Poverty of time, especially when it is associated with other deprivations such as inadequate income, wealth or public services, can impose hardships not only on the individuals directly experiencing it, but also on their dependents—the young, old or sick members of the household. The importance of household production for economic well-being is well-established and various approaches have been

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[1] For a discussion of the consistency between the definitions of thresholds and resources as a prerequisite for a coherent measure of poverty, see Citro and Michael (1995: 37).

developed to incorporate the time spent on household production in measures of economic well-being. A similar recognition of the impact of deficits in household production on economic "ill-being" has not yet emerged in the research on poverty measurement.

The problematic nature of poverty lines that neglect time requirements was first outlined by Claire Vickery several decades ago in a critique of the official poverty thresholds used in the United States (Vickery 1976). She demonstrated that the official thresholds implicitly assumed "that a household with income equal to the poverty standard must have a person working full time in the home to be nonpoor" (Vickery 1976: 30). This requirement could not be obviously met by families with only one employed adult and children; and, indeed, by many dual-earner families. Vickery proposed that estimates of required hours of household production implicit in the poverty thresholds should be constructed for households differentiated by size and composition (i.e., number of adults and children). In addition, some allowance should also be made for the time required for some basic personal care activities such as sleeping. Subtracting the sum of the threshold values of household production and personal care from the physically fixed number of hours in a week (168 hours per adult) yielded an estimate of the time available to the household for employment and other activities (such as leisure, volunteering etc.). The time deficit/surplus of the household could then be calculated as the difference between the time available and hours of employment. Vickery argued that, for households with time deficits, the standard poverty line should be modified by adding to it the monetized value of the shortfall in household production. Since households are assessed on the basis of income and time requirements, the result was a two-dimensional measure of time and income-poverty. Vickery was particularly interested in the ability of single-female headed households to escape income poverty via employment and hence she chose to operationalize the measure by estimating time deficits associated with full-time employment.

Subsequent studies on time and poverty can be broadly categorized into two groups. One group of studies followed Vickery's original approach of constructing thresholds for household production that may be implicit in the standard poverty thresholds and estimating time deficits on the basis of such thresholds and hours of employment. The incidence of income poverty was then assessed using modified poverty lines, i.e., standard poverty-lines augmented by the monetized value of time deficits (Douthitt 2000; Harvey and Mukhopadhyay 2007), or by subtracting the

monetized value of time deficits from household income (Burchardt 2008).[2] Douthitt (2000) as well as Harvey and Mukhopadhyay (2007) operationalized the measure by estimating time deficits associated with actual hours of employment. In contrast, Burchardt (2008) developed a more complex method of estimating time deficits associated with several possible values for hours of employment.[3]

The second group of studies does not entail the revision of standard poverty lines. Instead, they explore the nexus between time poverty and income poverty (Bardasi and Wodon 2010; Gammage 2010) or the prevalence of "time-pressure" (Goodin et al. 2005). Bardasi and Wodon specify time poverty lines (uniform for all adults—no gender differentiation) based on the distribution of individual working hours (both paid and unpaid work). If the individual in a poor household works hours that exceed the time poverty line then they are considered time-poor. However, an individual in a nonpoor household who works hours that exceed the time poverty line is considered as time-poor only if they can reduce the hours below the threshold without falling into poverty (Bardasi and Wodon 2010:56-63). Goodin et al specified the time thresholds in a more complex manner (Goodin et al 2005: 55-60). Briefly put, their method consists of deriving the thresholds for household production (differentiated by household size and dependent on the intrahousehold division of household production), personal care (uniform for all adults) and employment (differentiated by the actual or imputed hourly wage rate and dependent on intrahousehold contributions to household income).[4] The amounts of potential free time available to individuals are then obtained by subtracting the combined total of threshold values from the physically available hours (168 hours per week). Comparisons of actual free time—the difference between the physically available hours and the sum of actual hours spent on household production, personal care and employment—with potential free time were used to gauge the extent of "time-pressure illusion".

Our study is built along the lines of Vickery and the first group of studies referred to above. However, there are some crucial differences. First, we incorporate intrahousehold disparities in the division of household production explicitly into our measurement framework. This is

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[2] Antonopoulos and Memis (2010) provided estimates of time deficits in South Africa using a similar approach.
[3] For a formal treatment of Burchardt's approach, see Zacharias (2011), Appendix A.
[4] A conceptually similar methodology is followed by Hobbes et al. (2011) to develop estimates for "freely disposable time", i.e., time that can be spent for generating income in excess of the income poverty line or other activities such as education or leisure.

important in light of the available evidence regarding the pronounced gender disparities in the time spent on household production. That is, we allocate the household-level threshold value of household production among the members of the household according to the observed shares of the members in the actual, total hours spent on household production by all members of the household. The unit of analysis in our measure of time poverty is the individual and not the household as in Vickery and the other studies that have followed her approach. An important advantage of this methodological shift is the uncovering of a source of time poverty other than long hours of employment, namely, inordinately high demands of household production. Second, we evaluate the two-dimensional measure using both (a) actual hours of employment and actual household income; and, (b) full-time hours of employment and associated household income. This allows us to address the extent to which the picture of poverty is altered by taking time deficits into account, the concern addressed, for example, by Harvey and Mukhopadhyay and shed light on Vickery's central question about the effectiveness of employment as a means to escape poverty. Given our framework, the evaluation of the measure using full-time hours of employment and associated household income is considerably more complex than in Vickery's study and we confront this task using a microsimulation model. Finally, we provide estimates for Argentina (Buenos Aires), Chile (Greater Santiago), and Mexico using the latest available data. To our knowledge, ours is the first study to develop the Vickery-type measure of time and income poverty for countries in the developing world and one of the few studies to analyze the nexus between time and income poverty in multiple countries.

The rest of the paper has the following structure. We present our measurement framework and data in the next section (Section 2). This is followed by a discussion of the findings based on evaluating the measure using actual hours of employment and actual household income (Section 3). In the next section, we outline our microsimulation and analyze the results from evaluating the measure using full-time hours of employment and associated household income (Section 4). The final section concludes by outlining some policy considerations raised by the framework and findings.

2 Measurement framework and empirical methodology

2.1 Measurement framework

Our starting point is the basic accounting identity of time allocation which states that the physically fixed number of total hours equals the sum of time spent on employment, household production, personal care, and everything else which we denote as "leisure/free-time."[5] Assuming the unit of time to be a week, we can express the identity as:

$$168 \equiv L_i + U_i + C_i + V_i \tag{1}$$

In the equation above, L_i denotes the time spent on employment by individual i, U_i the time spent on household production, C_i the time spent on personal care, and V_i the time available as "free time." The equation for time deficit/surplus is derived from the identity by introducing the threshold values for personal care and household production:

$$X_{ij} = 168 - M - \alpha_{ij} R_j - L_{ij} \tag{2}$$

The time deficit/surplus faced by the individual i in household j is represented by X_{ij}. The principle behind the threshold values for personal care and household production is similar to the principle behind the thresholds of minimum consumption requirements for income poverty. That is, a person may actually only spend five hours a day sleeping, but we assume that they need, for example, 8 hours of sleep. The minimum required time for personal care and nonsubstitutable household activities is represented by M. Personal care includes activities such as sleeping, eating and drinking, personal hygiene, some minimum rest, etc. The idea behind nonsubstitutable household activities is that there is some minimum amount of time that the household members need to spend in the household and/or with other members of the household if the household is to reproduce itself as a unit.[6]

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[5] This section draws heavily from Zacharias (2011) and Zacharias, Antonopoulos and Masterson (2012).
[6] Vickery (1977, p.46) defined this as the minimum amount of time that the adult member of the household is required to spend on "managing the household and interacting with its members if the household is to function as a unit." She assumed that this amounted to 2 hours per day or 14 hours per week. Harvey and Mukhopadhyay (2007) made no allowance for this. Burchardt (2008, p.57) included a minimal amount of parental time for children that cannot be substituted. It is arguable that the inclusion of activities of "managing the household" in this category

The amount of substitutable household production time that is required for the household to subsist with the poverty-level income is denoted by R. If the household is at the poverty-level income, then, in order to attain the poverty-level consumption, it has to spend a certain number of hours in household production activities, conditional on its characteristics.[7] As we discussed in the previous section, income poverty lines used in poverty assessments generally rest on the implicit assumption that households around or below the poverty line possess the required number of hours to spend on household production. A central goal of our study is to do away with the assumption that *all* households possess these hours and make the household production needs of low-income households integral to the assessment of the nature and extent of poverty.

Numerous studies based on time use surveys have documented that there are well-entrenched disparities in the division of household production tasks among the members of the household, especially between the sexes.[8] Women tend to spend far more time in household production relative to men. The parameter α_{ij} is meant to capture these disparities. It is the share of an individual in the total time that their household needs to spend in household production to survive with poverty-level income.

An individual suffers from a time deficit if the *required* weekly hours of personal care and household production plus the *actual* weekly hours the individual spends on employment is greater than the number of hours in a week. In general, time deficits occur because hours of employment exceed the time available after setting aside the required hours of personal care and household production. We refer to this type of time poverty as the "employment time-bind." As we mentioned in the introduction, the standard approach recognizes only this route to time deficits. However, in some cases, time deficits may occur even before the hours of employment are taken into account due to excessive burdens of household production ("housework time-bind"). Such burdens can be the result of highly inequitable division of household work or, in

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might be double-counting, if we include household management activities in the definition of household production. However, it can also be argued that most of the nonsubstitutable time consists of the time that the household members spend with each other and that poverty-level household production does not include a "realistic" amount of time for household management. In practice, this is a relatively small amount of time and, therefore, either methodological choice would have no appreciable effect on the substantive findings.

[7] The characteristics that we take into account in our empirical work are the number of children, number of adults and, in the case of Mexico, location (rural versus urban).

[8] A voluminous body of work exists on this topic. For a recent overview and references, see Quisumbing (2004), Chapter 1 and Part 1.

several parts of the rural developing world, large amounts of time that needs to be spent on the collection of essential articles such as firewood and water. Indeed, some individuals might suffer from both types of time poverty ("double time-bind"). The three cases are summarized below:

Table 1 Types of time poverty

X_{ij}	A_{ij}	L_{ij}	Type
Less than zero	Greater than zero	Greater than zero	Employment time-bind
Less than zero	Less than zero	Equal to zero	Housework time-bind
Less than zero	Less than zero	Greater than zero	Double time-bind

Note: $A_{ij} = 168 - M - \alpha_{ij}R_j$. See equation (2). X_{ij}, A_{ij} and L_{ij} refer, respectively to the time deficit/surplus, available time, and employment hours for individual i in household j.

To derive the time deficit at the household-level, we add up the time deficits of the n individuals in the household, thus ruling out automatic redress of the time deficit of an individual in the household by the time surplus of another individual of the same household:

$$X_j = \sum_{i=1}^{n} \min(0, X_{ij}) \tag{3}$$

The adoption of the household as the unit of analysis in the definition of time poverty can obfuscate intrahousehold disparities. Consider the hypothetical allocation of time by the husband and wife in a family where both are employed and the only source of income is earnings (Figure 1). The time available to the wife after setting aside the required time for personal care and the amount of required household production time that falls upon her is shown on the horizontal axis by the distance from the origin to the point marked $A1$. Her hours of employment $(L1)$ exceed the time available to her and, therefore, she has a time deficit. On the other hand, the husband's hours of employment $(L2)$ fall short of the time available to him $(A2)$ as a result of the favourable intrahousehold division of housework. If we were to adopt the household as the unit of analysis, this household will appear to be time-nonpoor $(A1 + A2 = L1 + L2 = L)$ because the time poverty faced by the wife would be hidden. Our choice of individual as the unit of analysis for the measurement of time poverty was guided by the desire to avoid the pitfall

illustrated in this example and reflects our conviction that time poverty is intrinsically an individual-level phenomenon.[9]

Figure 1 Time-poor woman in a time-nonpoor household
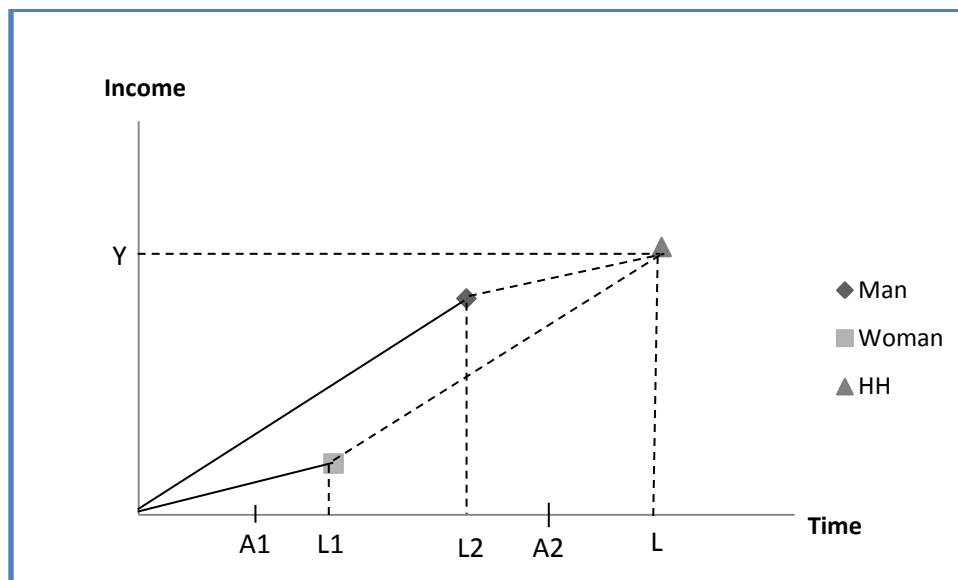
Now, if the household has a time deficit, i.e., $X_j < 0$, then it is reasonable to consider that as shortfall in time with respect to R_j; that is, we assume that the household does not have enough time to perform the requisite amount of substitutable household production. Neglecting such deficits can render the use of standard income poverty thresholds fundamentally inequitable. Consider two households that are identical in all respects that also happen to have an identical amount of money income. Suppose that one household does not have enough time available to devote to the necessary amount of household production while the other household has the necessary available time. To treat the two households as equally income-poor or income-nonpoor would be inequitable towards the household with the time deficit.

The problem of inequity can be resolved by revising the income thresholds. If we assume that the time deficit in question can be compensated by market substitutes, the natural route is to assess

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[9] From a normative standpoint, interhousehold comparisons of time-poverty that do not take into account the intrahousehold disparities can be fundamentally inequitable toward the individuals in the households. Consider two households that are identical in all respects, *A* and *B*, who also happen to possess the same amount of money income and the same amount of available time. The household *A* is "egalitarian" in the sense that the division domestic labor and paid labor among its members do not result in time deficit for any of its members. On the other hand, the household *B* is non-egalitarian and at least one of its members end up with a time deficit, defined as the amount by which their hours of employment exceed the time that they have available. Defining the two households as equally time-nonpoor is inequitable toward the individuals in household *B* who actually face the time deficit.

the replacement cost. The latter can then be added to the income poverty threshold to generate a new threshold that is adjusted by time deficit:

$$y_j^o = \bar{y} - min(0, X_j)\, p, \tag{4}$$

where y_j^o denotes the adjusted threshold, $\bar{y}$ the standard threshold, and p the unit replacement cost of household production. Obviously, the standard and modified thresholds would coincide if the household has no time deficit.

The thresholds for time allocation and modified income threshold together constitute a two-dimensional measure of time and income poverty. We refer to the measure as the Levy Institute Measure of Time and Income Poverty (LIMTIP). We consider the household to be income-poor if its income, y_j, is less than its adjusted threshold, and we term the household as time-poor if any of its members has a time deficit:

$$y_j < y_i^o \Rightarrow \text{income-poor household};\ X_j < 0 \Rightarrow \text{time-poor household} \tag{5}$$

For the individual in the household, we deem them to be income-poor if the income of the household that they belong to is less than the adjusted threshold, and we designate them as time-poor if they have a time deficit:

$$y_j < y_i^o \Rightarrow \text{income-poor person};\ X_{ij} < 0 \Rightarrow \text{time-poor person} \tag{6}$$

The LIMTIP allows us to identify the 'hidden' income-poor—households with income above the standard threshold but below the modified threshold—who would be neglected by official poverty measures and therefore by poverty alleviation initiatives based on the standard income thresholds. By combining time and income poverty, the LIMTIP generates a four-way classification of households and individuals: (a) income-poor and time-poor; (b) income-poor and time-nonpoor; (c) income-nonpoor and time-poor; and (d) income-nonpoor and time-nonpoor.

This classification offers a richer framework for thinking about the impacts of employment and income growth on poverty. The standard income poverty measure is, in this respect, a two-state

variable: any source of new income growth can make the household nonpoor or keep it poor. To illustrate the difference, consider the income-poor and time-nonpoor group. This group can include households that, if they tried to work their way out of poverty by allocating more time towards employment, might end up facing time deficits. For some households, then, it may not be possible to escape income poverty via employment because they will not earn enough to offset the monetized value of their time deficit. Likewise, in the income-nonpoor and time-poor group, there may be households that might fall into income poverty if they reduce their time deficit on their own, i.e., by cutting down on the time that they allocate towards employment. These concerns point to the importance of considering not just the actually observed situation of the household but also potential scenarios—an issue we address below via our simulation of a situation in which every employable adult of working age is employed full-time.

2.2 Empirical methodology

2.2.1 Data

The empirical implementation of our framework requires microdata on individuals and households with information on time spent on household production, time spent on employment, income from employment, and household income.[10] Given the importance of intrahousehold division of housework in our model, it is necessary to have information on the time spent on household production by all persons[11] in multi-person households. Good data on all the relevant information required for the LIMTIP is not available in a single survey for Argentina, Chile, and Mexico. But, good information on household production was available in the time use surveys, and good information regarding time spent on employment, income from employment, and household income was available in the income surveys in all three countries. Our strategy was to statistically match the time use and income surveys to create a synthetic data file. A brief description of the matching procedure is provided in Appendix A. The surveys used in the study are shown in Table 2.

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[10] This section and the subsequent sections of the paper draw heavily from Zacharias, Antonopoulos and Masterson (2012).

[11] Our basic concern is that we should have information regarding household production by both spouses (partners) in married-couple (cohabitating) households, and information on older children, relatives (e.g. aunt), and older adults (e.g. grandmother) in multi-person households.

Table 2 Surveys used in the study

Country	Income Survey	Time use Survey
Argentina[1]	Encuesto Annual de Hogares (EAH), 2005	Encuesta de Uso del Tiempo de la Ciudad de Buenos Aires (UT), 2005
Chile[2]	Encuesta Caracteristización Socioeconómica Nacional (CASEN), 2006	Encuesta Experimental sobre Uso del Tiempo en el Gran Santiago (EUT), 2007
Mexico[3]	Encuesta Nacional de Ingresos y Gastos de los Hogares (ENIGH), 2008	Encuesta Nacional sobre Uso del Tiempo (ENUT), 2009

Notes: [1]The UT collected information only from one individual (aged 15 to 74 years old) per household and was restricted to the city of Buenos Aires. Our results for Argentina, therefore, pertain to the city of Buenos Aires.
[2]The EUT covered only individuals (aged 12 to 98 years old) that lived in Gran Santiago. Our results for Chile are, therefore, valid only for Gran Santiago.
[3]The ENUT is a nationally representative survey of all individuals (aged 12 years and older) and our results are valid for the whole country, unlike the case with Argentina and Chile.

2.2.2   Estimating time deficits

We estimated time deficits (see equation (2) above) for individuals aged 18 to 74 years. The minimum required weekly hours of personal care were estimated as the sum of minimum necessary leisure (assumed to be equal to 14 hours per week)[12] and the weekly averages (for all individuals aged 18 to 74 years) estimated directly from the time use surveys for the following activities: sleep; eating and drinking; hygiene and dressing; and rest.[13] We assumed that weekly hours of nonsubstitutable household activities were equal to 7 hours per week. The resulting estimates are shown below in Table 3. The line labelled 'Total' is our estimate of the parameter *M* in equation (2) above.

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[12] It should be noted that 14 hours per week was 20 hours less than the median value of the time spent on leisure (use of media plus free time) in Argentina and Chile. For Mexico, the median value of the time spent on leisure was 21 hours per week. We preferred to set the threshold at a substantially lower level than the observed value for the average person in order to ensure that we do not end up "overestimating" time deficits due to "high" thresholds for minimum leisure.

[13] For Mexico, we estimated the averages for urban and rural areas separately.

Table 3 Thresholds of personal care and nonsubstitutable household activities

	Mexico		Chile	Argentina
	Urban	**Rural**		
Personal maintenance	86	92	93	87
Sleep	56	62	62	57
Eating and drinking	8	8	10	11
Hygiene and dressing	6	6	3	4
Rest	1	2	4	1
Necessary minimum leisure	14	14	14	14
Nonsubstitutable household activities	7	7	7	7
Total	93	99	100	94

In order to estimate time deficits, we also had to construct thresholds for the time spent on household production (R_j in equation (2)). The thresholds are defined for the household and, in principle, they represent the average amount of household production that is required to subsist at the poverty-level of income. The reference group in constructing the thresholds consists of households with at least one nonemployed adult and income around the official income poverty line. Our definition of the reference group is motivated by the need to estimate the amount of household production implicit in the official poverty line. Since poor households in which all adults are employed may not be able to spend the amount of household production implicit in the official poverty line, we excluded such households from our definition of the reference group.[14]

We divided the reference group into 12 subgroups based on the number of children (0, 1, 2, and 3 or more) and number of adults (1, 2, and 3 or more) for calculating the thresholds. Our assumption is that the required hours of household production for the household as a whole should increase with the number of adults in the household, and with the number of children in the household. We think that this is a reasonable assumption.[15] The thresholds were calculated as

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[14] For a discussion of the danger of "circularity" in the construction of thresholds of household production, see Burchardt (2008, p.59). It is noteworthy that in their empirical estimates neither Vickery nor Harvey and Mukhopadhyay chose households with income around the poverty line as the reference group, though this is exactly what the conceptual model requires. Instead, both chose *all* families with nonemployed spouses or nonemployed single parents. The implicit assumption in the procedure is that, irrespective of their family income, such households will spent as much time on household production as households with income around the poverty line. Vickery justified her decision on the grounds of inadequate data while Harvey and Mukhopadhyay provide no explanation.

[15] Actual hours estimated from sample data need not necessarily satisfy our assumption due to a variety of reasons. In our study, the estimates for Mexico directly satisfied our assumption regarding the gradient with respect to

the average values of the time spent on household production by households in each subgroup. In the case of Mexico, we estimated the thresholds directly from the time use survey because the survey contained enough information (time use for all individuals in the households and reasonably good information on income for households in the reference group). The estimates were obtained separately for the urban and rural areas in Mexico (Table 4).

**Table 4 Threshold hours of household production (weekly hours per household)**

	No child	1 child	2 children	3 or more children
Argentina				
1 adult	18	45	64	76
2 adults	40	63	83	94
3 or more adults	95	118	137	148
Chile				
1 adult	26	47	67	74
2 adults	36	56	76	84
3 or more adults	67	87	98	105
Mexico - Urban				
1 adult	33	48	58	82
2 adults	54	79	90	101
3 or more adults	85	103	116	157
Mexico - Rural				
1 adult	41	48	64	88
2 adults	60	86	93	109
3 or more adults	87	118	134	166

After we estimated the threshold hours of household production, we determined the share of each individual in the household in household production (represented by α_{ij} in equation (2)). This was done using the matched data. We assumed that the share of an individual in the threshold hours would be equal to the share of that individual in the observed total hours of household production in their household. Consider the hypothetical example of a household with only a husband and wife in urban Mexico. If the synthetic data showed that spouses spent an equal amount of time in household production, we divided the threshold value of 54 hours equally between them. However, the equal sharing of housework between the sexes is the exception

children and number of adults. For Argentina and Chile, minor adjustments were required for some of the 12 subgroups in the reference group.

rather than the norm, as illustrated in the case for Argentina and Chile in the box plots below.[16] The picture clearly shows that most of the distribution for men lies to the left of the distribution for women.

Figure 2 Person's share in the total hours of household production (percent), persons 18 to 74 years: Argentina and Chile
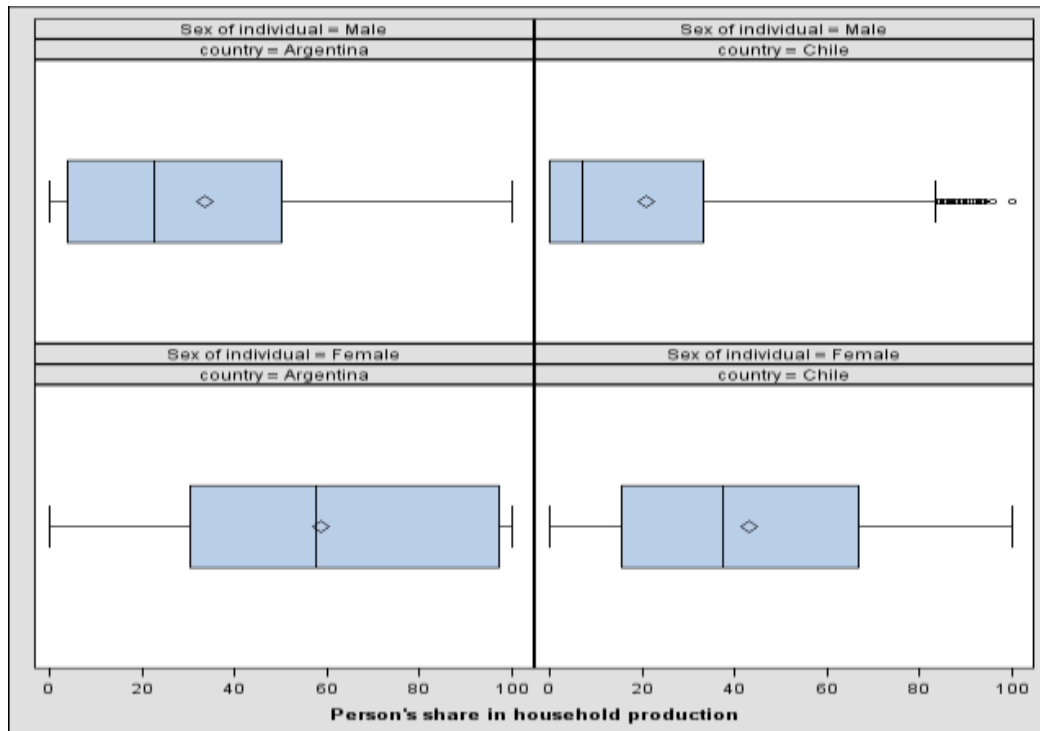
Note: The left and right edges of the box indicate the intra-quartile range (IQR), i.e., the range of values between the 25th and 75th percentiles. The marker inside the box indicates the mean value. The line inside the box indicates the median value.

The final step in calculating the time deficits for individuals, according to equation (2) above, consists of obtaining the actual weekly hours of employment. We used the hours reported by individuals in the income surveys. Further, we took commuting time into account by adding 'threshold' values of commuting to hours of employment. The latter were estimated from the time use surveys for employed individuals, aged 18 to 74 years, differentiated by their full-time/part-time status. For Mexico, the estimates were obtained separately for urban and rural areas (see Table 5 below).

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[16] We are omitting the plot for Mexico due to reasons of space.

Table 5 Commuting time of employed individuals (weekly hours per adult, 18 to 74 years)

	Mexico		Chile	Argentina
	Urban	Rural		
Part-time	2.8	3.0	2.4	1.4
Full-time	5.8	6.1	4.7	3.8

The steps described above yielded information sufficient to estimate the time deficits for all individuals aged 18 to 74 years. The household-level value of time deficits could then be obtained in a straightforward manner by summing the time deficits of individuals in the household (see equation (3)).

2.2.3 Adjusting poverty thresholds

A few additional steps were required to obtain the poverty lines adjusted by the monetized value of time deficits. The official income poverty threshold (specified in monthly per capita terms) used in our study for Argentina and Chile were, respectively 268.17 pesos (national currency) and 47,099 pesos (national currency). For Mexico, we used the official 'economic well-being' definition of poverty, which is different from the concept of income poverty used by the National Council for Evaluation of Social Development Policy (CONEVAL). In 2008, the poverty line for persons in urban areas was about 1,900 pesos (national currency) and about 1,200 pesos in rural areas.

Apart from the official poverty thresholds, we also needed information on the unit replacement cost of household production in order to obtain our adjusted thresholds. We employed the standard assumption of setting the unit replacement cost equal to the average hourly wage of domestic workers. For Mexico, we estimated the average wage from the labour force survey (ENOE). It was roughly 19 pesos in urban areas and 14 pesos in rural areas. For Argentina and Chile, the estimates were obtained from the income surveys and equalled, respectively, 3.54 pesos and 988.9 pesos.[17]

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[17] We obtained the household-level poverty line in Argentina and Mexico by multiplying the per capita threshold with the adjusted household size (number of equivalent persons). In contrast, no equivalence scale is used in the official Chilean poverty estimates. Therefore, the household-level poverty line was obtained by multiplying the per capita threshold by household size.

Time deficit of the household (measured in weekly hours) was multiplied by 4 to convert them into monthly hours. The monthly value of time deficit was monetized using the hourly wage of domestic workers and then added to the official poverty threshold for the household to derive the adjusted income poverty thresholds. These thresholds in conjunction with the estimates of time deficits are sufficient to estimate the LIMTIP for the samples under study.[18]

2.2.4   Simulations of employment and housework

As noted in the introduction, a key motivation of Vickery in designing the time and income poverty measure was to address the effectiveness of employment as a route out of poverty. Indeed, this is a crucial issue in the design of anti-poverty policies and development strategies globally and especially in the developing world. In order to assess the complex relationship between employment, income poverty, and time poverty, we conducted a microsimulation exercise. The purpose of the simulation was to address the following question: what will be the picture of income and time poverty if every employable adult who is currently nonemployed or working part-time were to work full-time under the existing pattern of full-time employment and earnings? In particular, we are interested in the outcomes for individuals who are currently income-poor according to the LIMTIP definition.

Some caveats are in order in terms of evaluating the results of the simulation exercise. In reality, any movement towards full-time employment for every employable adult who is currently nonemployed or underemployed is bound to be accompanied by significant structural changes in the economy in terms of the composition of output and employment. It is also hard to imagine such a change occurring without a whole host of changes in institutional structures—changes that would either precede or occur in tandem with the movement towards full employment— including that of the family and gender norms regarding time allocation. Our simulation exercise is not meant to capture the effects that the whole gamut of these changes will have on income and time poverty. Instead, it can be viewed as conveying useful information regarding the likely first-order effects of poor, employable adults finding full-time employment in the absence of a well-thought out jobs programme or development strategy that incorporates consideration of time poverty.

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[18] In the case of Mexico, we revised the official definition of household income in order to account for hired domestic help. See Appendix B for details.

The scenario that we are simulating is one in which all eligible adults[19] not working full-time[20] receive full-time employment. From a modelling standpoint, assessing the impact of such a scenario on the standard income poverty measure is far less complex than on LIMTIP. The effect that full-time employment will have on the standard income poverty measure is entirely via the income channel: People who were previously only employed part-time or not employed are now assumed to be employed full-time and receiving earnings. This leads to an increase in their household income, relative to what is observed in the data. The effect of full-time employment on the LIMTIP is more complex because in addition to the income channel, time allocation patterns are also assumed to change. We assumed that becoming employed full-time can change the hours of household production of the person and that of the other persons who belong to their household. In other words, the intrahousehold division of housework, captured in the parameter α_{ij} in equation (2), can change. As a result, the time deficit of the individuals of the household and the LIMTIP classification of the individual and household can also change. We ascertained the revised hours of household production for individuals who 'received' full-time employment in the simulation and their household members by matching them to similar individuals. Details on the simulation procedure are provided in Appendix C.

3   Estimates of time and income poverty

Our main objective is to ascertain the effects of incorporating time deficits on the picture of poverty within each country rather than to provide directly comparable international estimates. As explained earlier, due to limited geographic coverage of the time use surveys for Argentina and Chile, the samples for the study are drawn from, respectively, the city of Buenos Aires and Greater Santiago. On the other hand, our results for Mexico are nationally representative. The differences in the geographical coverage of the samples make the cross national comparison of the results rather difficult. Additionally, the use of separate (absolute) poverty lines across countries also introduces its own set of limitations on direct comparisons between the countries, well-known in the literature on international comparisons of income poverty. These limitations should be borne in mind while considering the estimates reported below.

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[19] In these simulations, eligible adults are defined as all individuals between the ages of 18 and 74 who are not disabled, retired, in school, or in the military. These restrictions, other than age, could not all be applied for each country. The age restriction is simply the broadest age categorization for which all three countries had time use data.
[20] Full-time is defined as working twenty-five hours per week or more.

3.1 The hidden poor

We begin by contrasting the picture of income poverty according to the official threshold and our preferred threshold—the official threshold adjusted by the monetized value of the time deficit (LIMTIP threshold). As we would expect, the number of poor and poverty rate would be higher with the LIMTIP than the official threshold. We refer to those who are income-poor under the LIMTIP threshold and income non-poor as the hidden poor because their income shortfall remains invisible unless their time deficits are taken into account. The proportion of hidden poor households in the total number of households is referred to below as the hidden poverty rate.

Table 6 Poverty of households and individuals: Official vs. LIMTIP

	Argentina		Chile		Mexico	
	Number (thousands)	Rate (percent)	Number (thousands)	Rate (percent)	Number (thousands)	Rate (percent)
Households						
Official	60	6	165	11	10,718	41
LIMTIP	107	11	270	18	13,058	50
Hidden poor	*47*	*5*	*105*	*7*	*2,340*	*9*
Individuals						
Official	226	9	729	13	49,973	47
LIMTIP	409	16	1,161	20	59,494	56
Hidden poor	*183*	*7*	*432*	*8*	*9,520*	*9*
Men						
Official	67	7	176	9	12,910	41
LIMTIP	121	13	294	15	15,705	49
Hidden poor	*54*	*6*	*118*	*6*	*2,795*	*9*
Women						
Official	75	7	239	11	15,161	43
LIMTIP	138	12	380	18	18,144	51
Hidden poor	*63*	*6*	*141*	*7*	*2,983*	*8*
Children						
Official	84	16	315	19	21,902	57
LIMTIP	150	28	487	29	25,644	67
Hidden poor	*65*	*12*	*172*	*10*	*3,742*	*10*

Note: Children are defined as persons below 18 years of age. The numbers along the row labelled "Hidden poor" are calculated by subtracting the numbers in the "Official" row from the numbers in the "LIMTIP" row. Numbers may not add up exactly due to rounding.

Our estimates of the size of the hidden poor suggest that ignoring time deficits in household production led to a major underestimation of the incidence of income poverty in all three countries (Table 6). The number of poor households increased by 78, 64 and 22 percent,

respectively, in Argentina, Chile and Mexico when time deficits were taken into account. Similar increases can also be observed for all individuals, men, women and children.

The poverty rate for individuals was somewhat higher than the rate for households because, on average, poor households had more members than nonpoor households in all three countries. Children had a higher poverty rate compared to that of adults because families with children had a much higher poverty rate than all households (see below).We found that the gap between men's and women's income poverty rate was almost non-existent in Argentina by either the official or LIMTIP measure. In contrast, in Chile and Mexico, women experienced slightly higher rates of income poverty than men by both measures. The relatively small gender gap in the hidden poverty rate suggests that the impoverishing effects of time deficits were felt by both men and women to a roughly equal degree. As the proportion of women in the overall population was greater than men in all three countries, the total number of poor women would be greater than poor men, even if both had the same poverty rate. We found that in all three countries, there were in fact more poor women than poor men according to both the LIMTIP and official measures. In Argentina, this was purely due to the demographic effect since the poverty rate (LIMTIP and official) was roughly similar for men than women. However, in Chile and Mexico, the demographic effect was compounded by the higher poverty rates (LIMTIP and official) of women. Thus, the 'face' of poverty is feminized in the sense of poor women outnumbering poor men in all three countries. But, this would not have been the case in Argentina if not for the fact there were more women than men in the adult population.

The hidden poverty rate of households depends on the proportion of households that are classified as income-nonpoor according to the official poverty line but face some level of time deficits in the total number of households. Obviously, if there are no time-poor households among the officially income-nonpoor population then the official and LIMTIP poverty rates would be identical. The difference between the official and LIMTIP rate is also a function of the proportion of households with income below the LIMTIP poverty line in the total number of time-poor households that are officially classified as income-nonpoor. Clearly, if everyone in the latter group (time-poor and officially income-nonpoor) had high enough income to compensate

for the monetized value of their time deficits, then the official and LIMTIP rate of income poverty would be identical.[21]

Table 7 Factors affecting the hidden poverty rate (LIMTIP minus official poverty rate), all households (percent)

	Argentina	**Chile**	**Mexico**
Hidden poverty rate	5	7	9
Time-poor and offically income-nonpoor/All	49	55	40
Hidden poor/Time-poor and officially income-nonpoor	10	13	22

The estimates shown in Table 7 indicate that the percentage of households that are time-poor and officially income-nonpoor in the total number of households was quite substantial in all three countries, with Chile leading the pack at 55 percent, followed by Argentina (49 percent) and Mexico (40 percent). However, the rankings of the three countries are different in the percentage of households with income below the LIMTIP poverty line in the total number of time-poor households that are officially classified as income-nonpoor. Over a fifth (22 percent) of such households did not have income high enough to compensate for their time deficit in Mexico. Indeed, this is why the gap between the official and LIMTIP income poverty rate is the highest in Mexico. In Argentina, only about 10 percent of households that were officially income-nonpoor and time-poor did not have enough income to overcome the monetized value of time deficit, while in Chile it was higher, at 13 percent.

3.2   Unmet income needs

Taking time deficits into account affects the depth and severity of income poverty. For the officially income-poor households with time deficits, the addition of the monetized value of time deficit to their poverty line increases their income deficit (the difference between the poverty line and income). This has the effect of increasing the average income deficit of all poor households under the LIMTIP definition relative to the official definition. The average deficit is also affected by the addition of the hidden-poor, though its effect on the overall average deficit is hard to predict a priori. Needless to say, the officially income-poor households without time deficits would experience no change in their deficit because their poverty lines are not affected by the

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[21] Let N be the total number of households, H the total number of "hidden poor" households and S the total number of officially income-nonpoor households who are time-poor. Further, let P and P^* represent, respectively, the official and LIMTIP income poverty rates. Then: $P^* - P = (S/N)(H/S)$.

monetization of time deficits. The average deficit of all poor households would thus be the weighted average of the average deficits of the three groups, where the weights are their respective shares in the income-poor population.

Table 8 Average income deficit (expressed as amount in national currency and as percent of poverty line) and share (in the total number of income-poor households) of income-poor households by subgroup

	Official			LIMTIP		
	Share (percent)	Deficit		Share (percent)	Deficit	
		Amount	Percent		Amount	Percent
Argentina						
Income-poor, time-nonpoor	53	236	42	30	236	42
Officially-poor, time-poor	47	326	30	26	718	47
Hidden income-poor				44	341	20
All income-poor	100	278	37	100	409	34
Chile						
Income-poor, time-nonpoor	51	69,287	43	31	69,287	43
Officially-poor, time-poor	49	63,115	29	29	162,087	49
Hidden income-poor				39	78,599	20
All income-poor	100	66,289	36	100	100,279	36
Mexico						
Income-poor, time-nonpoor	37	2,612	40	30	2,647	41
Officially-poor, time-poor	63	2,868	40	52	4,853	52
Hidden income-poor				18	1,646	17
All income-poor	100	2,773	40	100	3,608	43

Note: For Mexico, the income deficit of the official-poor, time-poor households are different under the LIMTIP and official definitions. The source of this difference is the adjustment made to account for hired domestic help—a type of expenditure that was incurred by about 7 percent of all households. We subtracted the cost of contribution made by hired domestic help toward meeting the threshold hours of household production from the official measure of household income to derive our estimate of LIMTIP income poverty (see Appendix B).

Our estimates showed that the average LIMTIP income deficit for the poor households was 1.5 times higher than the official income deficit in Argentina and Chile, while in Mexico it was 1.3 times higher (Table 8). Thus, the official measure grossly understates the unmet income needs of the poor population in the countries under study. From a practical standpoint, this suggests that taking time deficits into account while formulating poverty alleviation programs will alter the focus of both the coverage (including the 'hidden poor' in the target population) and the benefit levels (including the time-adjusted income deficits where appropriate). As expected, the sharp increase in the deficits of the officially poor, time-poor households contributed to the wedge between the LIMTIP and official deficit. The LIMTIP deficit of this group was 2.2 times higher than the official deficit in Argentina, 2.6 times in Chile, and 1.7 times in Mexico. They were also

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quite large in terms of their share in the officially income-poor population. In Argentina and Chile, nearly 50 percent of the officially poor households also suffered from time poverty, while in Mexico they constituted the majority at 63 percent. In Argentina and Chile, the addition of the hidden poor to the ranks of the income-poor appears to have contributed to the widening of the LIMTIP deficit relative to the official deficit because the average deficit of the hidden poor was higher than the official deficit of the income-poor and time-nonpoor households. On the other hand, in Mexico, the opposite was the case. However, expressed as a percentage of poverty line, the income deficit of the hidden poor was lower than the other two groups because of their relatively higher incomes.

3.3   Income poverty by demographic characteristics

Any measure of poverty will find that certain groups are harder hit than others. Here, we break down the overall population of the study countries by household and individual characteristics to shed light on the differential impact of time and income poverty. This exercise highlights the importance of tailoring policy to address the specificities of each group.

3.3.1   Households

We look first at households broken down by employment status and family type (Table 9). Note that hidden poverty is much more prevalent among the employed than the non-employed households (6 versus 3 percent in Argentina, 7 versus 4 percent in Chile and 11 versus 4 percent in Mexico).[22] This makes intuitive sense since employed individuals are more likely to suffer time deficits and so bring their household into the hidden poverty category. The gap between the poverty rates of employed and non-employed households is smaller for LIMTIP poverty than for official income poverty in all three countries and in fact, in Mexico the LIMTIP poverty rate for employed households is 3 percent higher than for nonemployed households. This finding highlights the importance of accounting for time deficits.

Turning to employed households, we naturally expect official poverty to be higher among households with the spouse of the head not working than in those with both the head and the spouse working. What is surprising to see is that hidden poverty is slightly higher among the latter group in Argentina and Chile (7 versus 6 percent and 8 versus 7 percent, respectively),

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[22] By an employed household we mean households in which either the head of the household, the spouse of the head or both are employed.

while in Mexico dual-earner households have a higher hidden poverty rate (15 versus 6 percent). This is perhaps due to higher earnings outweighing the higher time deficits in the Argentinian and Chilean contexts. In all three countries, households with employed heads and nonemployed spouses had higher rates of both official and LIMTIP income poverty than single-headed households or dual-earner households. Among single-headed households, female-headed households are at a distinct disadvantage, with higher rates of both official and LIMTIP income poverty in all three countries. They also had higher rates of hidden poverty, although in Mexico the difference was small (12 compared to 11 percent).

Family households tend to have higher rates of both official and LIMPTIP poverty than non-family households, as well as higher hidden poverty rates (6 compared to 0 percent for Argentina, 7 compared to 2 percent for Chile, and 9 compared to 8 percent for Mexico).[23] We see why when we consider that family households with children under the age of 18 have even higher rates of both official and LIMTIP poverty. They also have higher rates of hidden poverty (11 percent for Argentina and 10 percent for Chile and Mexico). These results are intuitive both for official income poverty, since these families have a higher dependency ratio than other family households, and for LIMTIP poverty, as these households have greater required hours of household production. Of family households, single female-headed households had the highest poverty rates in Argentina and Chile, but in Mexico, married couple family households had the highest poverty rates. In terms of hidden poverty rates, there were only small differences among the sub-groups in Argentina and Mexico, but in Chile the rate ranged from 4 percent for single male-headed family households to 9 percent for single female-headed family households. Looking at family households with children under 18, we find that single male-headed households have the largest poverty rates in Argentina, while in Chile, single female-headed households do, and in Mexico, the rates for married couple households are only slightly lower than for single female-headed households. Clearly the contours of household poverty are very different in each of the countries in our study and so a cookie-cutter approach to poverty reduction will not suffice.

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[23] Family household is defined as a household in which at least one relative of the household head resides.

Table 9 Poverty of households by employment and family status: Official vs. LIMTIP

	Argentina		Chile		Mexico	
	Official	**LIMTIP**	**Official**	**LIMTIP**	**Official**	**LIMTIP**
All households	6	11	11	18	41	50
A. Employment status						
Employed household	5	11	9	16	40	51
Employed head of household, with employed spouse	3	9	3	10	31	46
Employed head of household, with nonemployed spouse	11	18	13	21	52	58
Employed head of household without spouse	4	7	9	17	28	39
Male	2	4	3	6	17	28
Female	5	9	11	22	33	45
Nonemployed head of household, with employed spouse	13	23	18	27	46	58
Neither head nor spouse employed	10	13	20	24	44	48
B. Family type						
Nonfamily households	2	2	8	10	15	23
Family households	8	14	11	18	43	52
Married couple	7	13	10	17	44	53
Single-female head	10	16	17	26	42	50
Single-male head	7	14	7	11	33	41
Family households with children under 18	12	23	15	25	49	59
Married couple	10	21	13	22	49	59
Single-female head	17	27	25	38	50	60
Single-male head	20	36	10	17	41	52
Addendum:						
Employed household with children under 18	8	17	10	19	44	55
Employed household with children under 6	10	22	16	27	54	66
Nonemployed household with children under 18	14	21	22	27	48	52

Finally, looking at the intersection of employed and family households presented in the addendum to Table 9, we can see that employed households with children under 18 suffer

higher-than-average rates of income poverty, both official and LIMTIP, in all three countries. Nonemployed households with children under 18 have even higher rates of poverty, except in the case of the LIMTIP poverty rate in Mexico. In all cases, their rates of hidden poverty are lower than for their employed counterpart households. Finally, employed households with children under 6 had the highest rates of LIMTIP poverty in Argentina and Mexico (although only slightly higher in Argentina, there was a 14% gap in Mexico), though their official income poverty rates were not as low as nonemployed households with children under 18.

Figure 3 Ratio of the LIMTIP income deficit to official income deficit of income-poor households
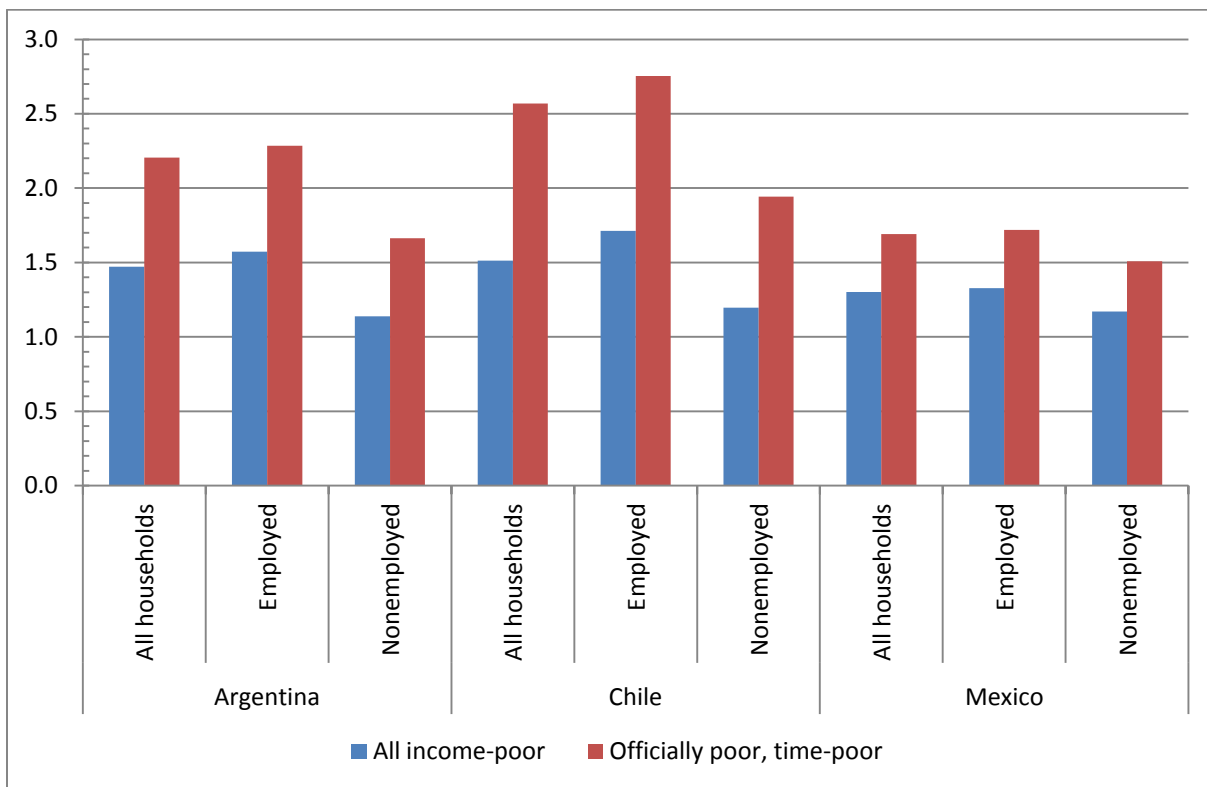
In Figure 3, we show a breakdown of the indicator of the income gap discussed in section 3.2 above, by a household's employment status. In all cases the ratio of households' LIMTIP income deficit to their official income deficit is higher for the officially poor, time-poor group than for all income-poor households. In all three countries we can see that the gaps are larger for employed than for nonemployed households, reflecting their larger time deficits. This effect is most noticeable in Chile, where the ratio of employed households' LIMTIP income deficit to

their official income deficit is largest (1.7 for all income poor households and 2.8 for officially poor, time-poor households).

3.3.2 Individuals

We now examine the distribution of individuals into different LIMTIP classification by sex and age. Figure 4 breaks down all adult individuals in each of the three study countries by sex and LIMTIP classification. The blue and red sections comprise all of the income poor while the blue and green sections comprise the time poor. From this breakdown we can see that women suffered higher rates of both time and income poverty, as well as the dual bind of time plus income poverty in all three countries (with the one exception of Argentina, in which 5 percent of both men and women were both income and time poor). It follows that a greater percentage of men suffered from neither income nor time poverty (the purple segment) in all three countries. We will break down these numbers in our discussion of Table 10, below. Figure 5 gives the breakdown of LIMTIP classification of households for children. As we saw above, family households suffered from greater rates of time poverty. Thus, between 70 and 80 percent of children in Argentina, Chile, and Mexico live in time-poor households. A greater proportion of children were living in income-poor households in Mexico (66 percent) compared to Argentina and Chile (28 and 29 percent, respectively).

Figure 4 Distribution of adults by LIMTIP classification income and time poverty status (percent)
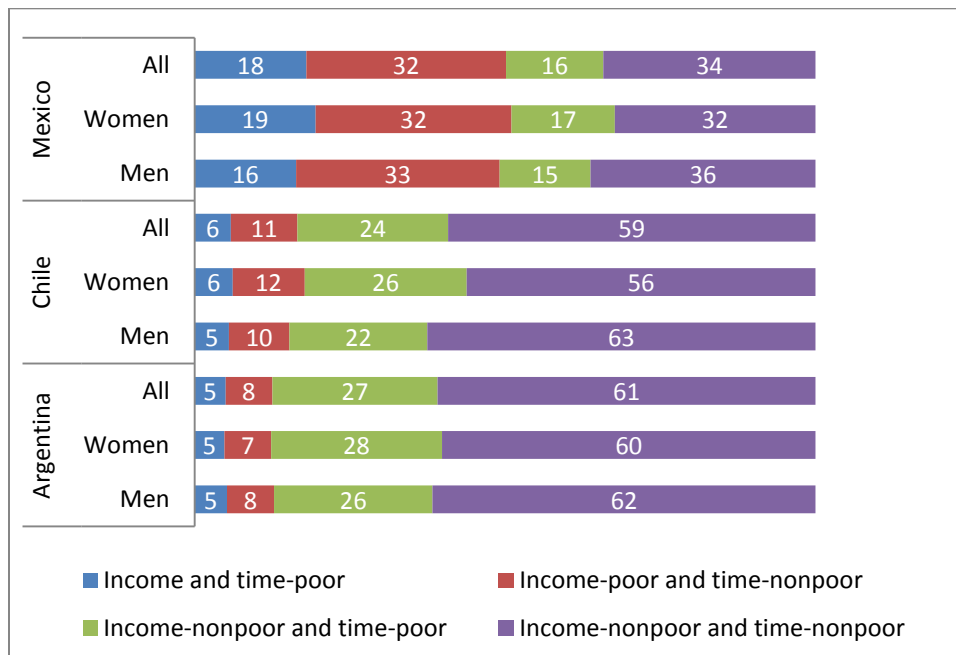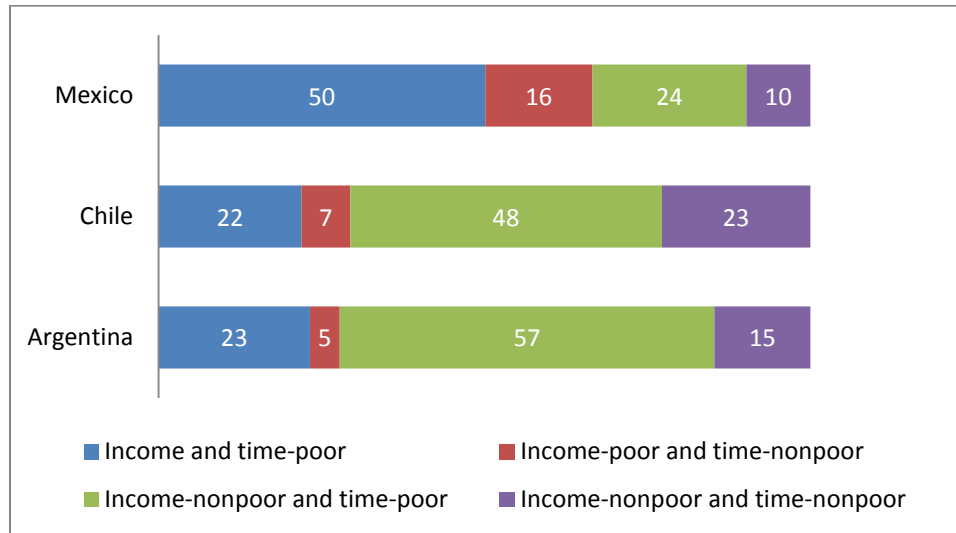
Figure 5 Distribution of children by LIMTIP classification of income and time poverty (percent)

	Income and time-poor	Income-poor and time-nonpoor	Income-nonpoor and time-poor	Income-nonpoor and time-nonpoor
Mexico	50	16	24	10
Chile	22	7	48	23
Argentina	23	5	57	15

Turning to Table 10, we note two striking implications of accounting for time deficits in the measurement of poverty. First, employed persons constituted a greater proportion of the poor under the LIMTIP poverty line than the official poverty line. This is clearly indicated by the fact that the percentage increase in the poor from the official definition to the LIMTIP definition (shown in the last column of the table) was far higher for employed individuals than for nonemployed in all three countries. In Argentina, the employed was 46 percent of the official income-poor and 58 percent of the LIMTIP income-poor; in Chile, the percentages were respectively 40 versus 52 percent; and in Mexico, the percentages were 55 and 59 percent. Income poverty is thus not just a result of a lack of employment, but also of people working for below-subsistence wages. Indeed, the availability of workers willing to work at below subsistence wages is partly a function of the existence of the poor nonemployed. To be successful, antipoverty policies will have to address both roots of poverty. Second, women account for a larger share of the employed poor when time deficits are taken into account. Our estimates showed that, in all three countries, the proportionate increase in the number of poor (shown in the last column of the table) was the largest for employed women. The share of employed women in the total number of employed poor increased from 43 to 46 percent in Argentina, 40 to 43 percent in Chile, and 34 to 36 percent in Mexico, once time deficits were taken into account. Men constituted the majority of the employed poor in Argentina and Chile only because, due to their higher employment rate, they were a large proportion of the employed;

the poverty rates for employed men and women were roughly identical in both these countries. In Mexico, however, the higher poverty rate of employed men also played a role in making them the majority of the employed poor.

Table 10 Number (in thousands) and composition of income-poor adults by employment status and sex

Country	Employment status	Sex	Composition (percent)		Number ('000)		Hidden poor		
			Official poor	LIMTIP poor	Official poor	LIMTIP poor	Number ('000)	Share (percent)	Percent of official poor
Argentina	Nonemployed	Men	21	15	28	37	10	9	35%
		Women	33	26	45	64	19	18	44%
	Employed	Men	26	32	35	77	42	38	118%
		Women	20	27	27	65	38	35	142%
	All		100	100	135	243	109	100	81%
Chile	Nonemployed	Men	18	14	73	93	20	8	27%
		Women	41	34	164	222	58	23	36%
	Employed	Men	24	29	96	192	96	38	100%
		Women	16	22	65	144	79	31	122%
	All		100	100	398	651	253	100	64%
Mexico	Nonemployed	Men	9	9	2,486	2,817	332	6	13%
		Women	36	32	9,640	10,655	1,015	18	11%
	Employed	Men	37	38	9,934	12,357	2,423	43	24%
		Women	19	21	5,035	6,965	1,930	34	38%
	All		100	100	27,095	32,795	5,700	100	21%

3.4   Time-poor households

Finally, we examine time-poor households in order to understand the differential incidence of time poverty in these households by sex, income poverty, and employment status (Table 11). The first thing to notice is that women in income poor households generally have higher rates of time poverty in all three countries, whether employed or not. The only exception is in Argentina, where nonemployed women in income poor and income nonpoor households have the same rate of time poverty. A second striking (though perhaps less surprising) characteristic of all three countries is the very low incidence of time poverty of nonemployed men in each country. Only in Argentina did nonemployed men suffer from time poverty appreciably and even there, only 2

and 1 percent of men in income poor and nonpoor households, respectively, did so. The other side of this particular coin is that nonemployed women contribute greatly to the overall rate of time poverty among women, especially in poor households. In fact, if we only considered the time poverty of those who were employed, we would say that men in income poor households suffered significantly higher rates of time poverty than women in all three countries, while, in truth, their rates of time poverty were just above that of women in Argentina and Chile and substantially lower in Mexico. In nonpoor households the greater prevalence of time poverty among nonemployed women than men increases the overall gap in time poverty rates by 5, 6 and 9 percent in Argentina, Chile and Mexico, respectively.

Table 11 Decomposition of the time poverty rate of men and women in time-poor households

Income poverty status	Sex	Share in population (percent)		Time poverty rate (percent)			Contribution (percentage point)	
		Non-employed	Employed	Non-employed	Employed	All	Non-employed	Employed
Argentina								
Poor	Men	25	75	8	69	54	2	52
	Women	42	58	25	74	53	11	43
Nonpoor	Men	11	89	12	53	48	1	47
	Women	26	74	25	68	57	6	50
Chile								
Poor	Men	23	77	2	64	50	0	49
	Women	52	48	19	81	49	10	39
Nonpoor	Men	13	87	1	49	43	0	43
	Women	34	66	17	70	52	6	47
Mexico								
Poor	Men	15	85	2	54	47	0	46
	Women	52	48	34	77	55	18	37
Nonpoor	Men	13	87	1	51	45	0	44
	Women	38	62	23	74	55	9	46

4   Full-time employment and poverty

As we have shown in the previous section, time and income poverty are worth serious policy attention. The question then arises what policy would be best in alleviating time and income poverty. A frequent focus for income poverty alleviation is employment promotion. In order to assess the impact of such a policy, we created a simulation that, for each individual household,

estimates the impact of each eligible adult member attaining full-time paid work.[24] In this section, we present the aggregated results of that exercise. Details of the simulation itself can be found in Appendix C. As such, this is not an attempt to estimate the full-employment distribution of time and income poverty, earnings or household production. Rather, it is an estimation of the impact of any series of events, an employment-based poverty alleviation policy included, that will allow households to access full-time employment.

The overall impact of the simulation is presented in Table 12. In each country official poverty is significantly reduced, but LIMTIP income poverty rates, post-simulation, are still comparable to official income poverty rates pre-simulation.[25] The incidence of hidden poverty actually increases slightly in Chile and quite substantially in Mexico, rising from 9 percent to 19 percent in the latter. The decomposition of hidden poverty in the addendum demonstrates that this is due to the large increase in time poverty among the officially nonpoor due to the simulation (rising from 40 to 70 percent in Mexico), which is offset in Argentina and Chile by the lower incidence of hidden poverty among the time poor but officially nonpoor. The exception is Mexico where the rate of hidden poverty among the latter group increased. The overall impact of the full-time employment simulation then is to decrease income poverty at the expense of either increasing time poverty or at least not alleviating it.

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[24] By eligible adult, we mean individuals aged 18 to 74 that are not retired, disabled or in school. By full-time employment we mean 25 hours a week of paid work or more.
[25] Note that, since the simulation necessarily reduces household production hours done by households, the adjusted income poverty line for each household affected by the simulation rises as a result of the simulation.

Table 12 Actual and simulated income poverty rates (percent)

	Argentina		Chile		Mexico	
	Actual	Simulation	Actual	Simulation	Actual	Simulation
Official income-poor	6	1	11	3	41	21
LIMTIP income-poor	11	6	18	11	50	39
LIMTIP minus official (hidden poor)	5	5	7	8	9	19
Addendum: Decomposition of the hidden poverty rate:						
Time-poor and offically income-nonpoor/All (percent)	49	63	55	79	40	70
Hidden poor/Time-poor and officially income-nonpoor (percent)	10	8	13	11	22	26

4.1 The hard-core poor

One important finding from our simulation exercise is the large number of hard-core poor households: those households that remain income poor[26] despite full-time employment for all eligible adult household members. In all three countries, the majority of income poor households remain in income poverty (see Table 13). In Mexico the proportion of hard-core poor is 75 percent. The implication is that the types of jobs likely to be obtained by most of the eligible adults currently not working full-time are low-paying, certainly not high-paying enough to make up for the increased time deficits incurred by the household due to the increased allocation of time to paid work. This is further emphasized by the fact that 2 and 4 percent of nonpoor households in Chile and Mexico fell into poverty due to their increased labor market engagement. This point is further illustrated by Figures 6A & 6B, which highlight the increase in time deficit and income deficit, respectively, of hard-core poor and other households before and after the simulation.

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[26] We refer here and in the rest of the paper to the LIMTIP income poverty line, unless otherwise specified.

Table 13 Changes in the income poverty status of households from actual to full-employment simulation

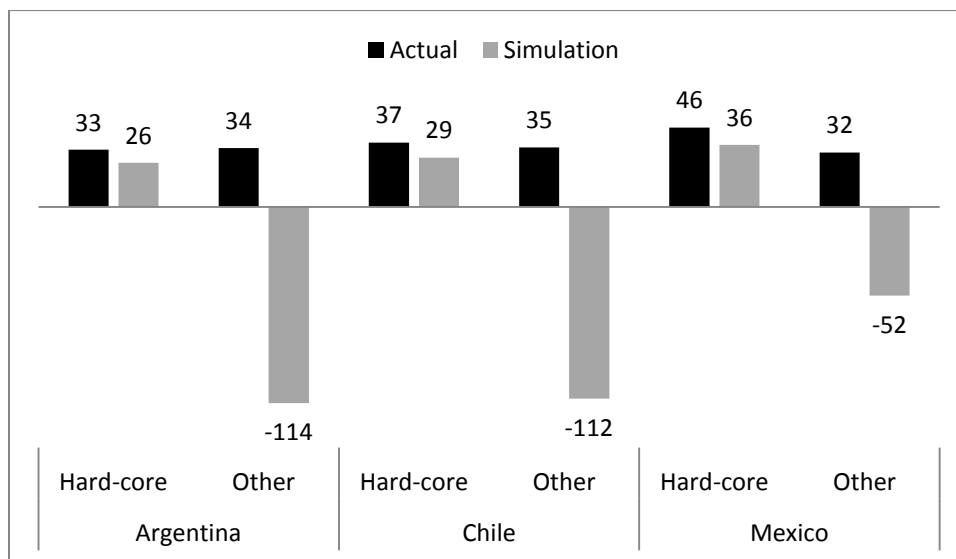|	Actual	Simulation		All
		Nonpoor	Poor	
Argentina	Nonpoor	100	0	100
	Poor	46	54	100
Chile	Nonpoor	98	2	100
	Poor	47	53	100
Mexico	Nonpoor	96	4	100
	Poor	25	75	100

First, notice that time deficits increase for all households under the simulation since we are assigning full-time employment to every eligible adult. However, the time deficits of the hard-core poor households in each country increase by a greater amount than that of other households. In Argentina and Chile time deficits increase by 16 hours for the hard-core poor, while increasing by 14 and 13 hours respectively for other households. In Mexico, hard-core poor households see their average time deficits increase by 22 hours per week, compared to 18 for other households. This means that the income hurdle that hard-core poor households needed to clear to escape income poverty increased at a greater rate than for other households. In this sense, hard-core poor households are in a scenario reminiscent of a nightmare, in which the more paid work they do the farther away the income poverty line gets.

Figure 6A Household time deficit (weekly hours)
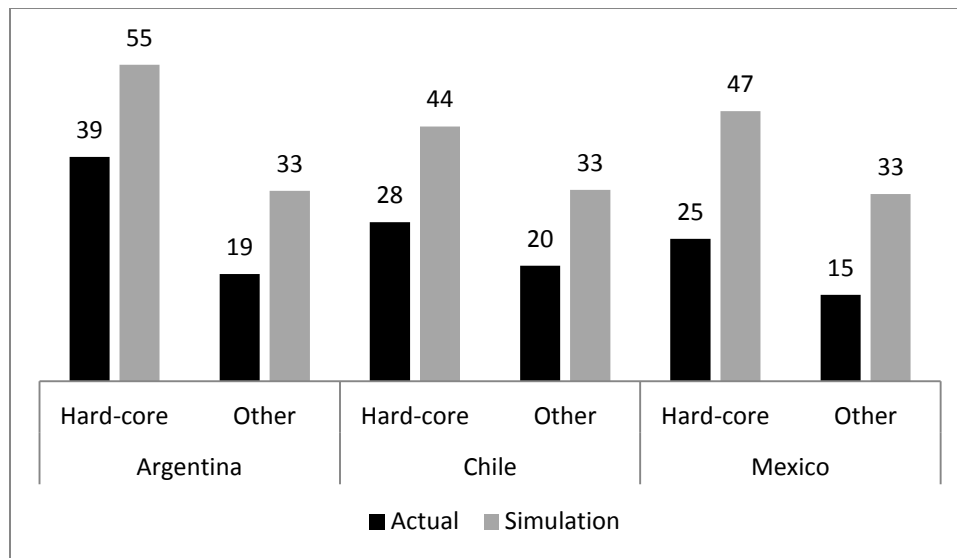
Interestingly, the income deficits actually faced by hard-core poor households in Argentina and Chile were similar to that of other households (slightly lower in the former country and slightly higher in the latter), although in Mexico they were 14 percentage points higher. And in each country, the shift into more paid work did in fact reduce the income deficits faced by hard-core poor households (by 7, 8 and 10 percentage points in Argentina, Chile and Mexico, respectively), other households felt a much greater impact on average. In Argentina, the average non-hard-core poor household wound up with household incomes more than double the income poverty line. In Mexico, the improvement was not as large, but non-hard-core poor households there still saw their average household incomes increase to more than 50 percent above the poverty line.

Figure 6B Household income deficit (% of poverty line)

4.2   The LIMTIP classification (actual and simulated)

We now turn to a more detailed analysis of the results of the simulation for households, men, women and children. Table 14 displays the distribution of households by the four LIMTIP categories before and after the simulations in all three countries. The first line shows us that the bulk of the hard-core poor are also actually time poor. In fact, the allocation of full-time jobs to adults in households that were income poor and time poor had little effect on the incidence of the dual bind of income and time poverty, in fact making it slightly higher in Mexico. A greater impact is seen in the second line, the income poor, time nonpoor. This category is almost eradicated, though largely through the substitution of time poverty for income poverty. Thus, for

the roughly 30 percent of income poor households in all three countries that do not also suffer from time poverty, employment generation policies might at least effect this trade-off. However, employment is clearly not an effective policy option for alleviating the poverty of the other 70 percent of the income poor that already suffer from time poverty. As we can see in the addendum, time poverty rates increase overall due to this simulation, as expected. What is more disturbing is that the already high incidence of time poverty among income poor households increases to 91 percent for Chile and 94 percent for Argentina and Mexico. This again emphasizes the importance of accounting for time deficits when assessing policy impacts.

Table 14 Actual and simulated LIMTIP classification of households (percent)

	Argentina		Chile		Mexico	
	Actual	**Simulation**	**Actual**	**Simulation**	**Actual**	**Simulation**
Income-poor and time-poor	8	6	12	10	35	37
Income-poor and time-nonpoor	3	0	6	1	15	2
Income-nonpoor and time-poor	44	58	49	71	30	52
Income-nonpoor and time-nonpoor	45	36	33	18	20	9
Addendum:Time-poverty rates						
All	52	64	61	81	65	89
LIMTIP income-poor	70	94	69	91	69	94
LIMTIP income-nonpoor	49	61	60	80	61	85

Finally we turn to the impact of the simulation on income poverty rates of men, women and children in the three countries under study (Table 15). First we note that the overall rate of hidden poverty among individuals in all three countries increased under the simulation. The rise was small in Argentina and Chile (1 percent) but significant in Mexico (11 percent). In the former two countries, increases in the hidden poverty of children account for the bulk of the overall increase, with unchanged rates for adults in Argentina and only slightly higher rates for women in Chile. In Mexico, hidden poverty among adults increased by 9 and 10 percentage points among men and women, respectively. The increase among children in Mexico was also higher at 13 percentage points. Thus the apparent impact of an employment policy, as indicated by the drop in the official poverty rates for individuals, would mask deepening rates of hidden poverty. In effect employment generation could make poverty seemingly disappear while ignoring and for some exacerbating the hardships already faced by many individuals.

Table 15 Official, LIMTIP and hidden income poverty rates for individuals, actual and simulated

		Actual			Simulation		
		Official	LIMTIP	Hidden	Official	LIMTIP	Hidden
Argentina	Men	7	13	6	2	7	6
	Women	7	12	6	1	7	6
	Children	16	28	12	5	19	15
	All	9	16	7	2	10	8
Chile	Men	9	15	6	1	8	6
	Women	11	18	7	2	10	8
	Children	19	29	10	5	19	15
	All	13	20	8	3	12	9
Mexico	Men	40	49	9	19	37	18
	Women	43	51	8	20	38	18
	Children	57	67	10	34	56	23
	All	47	56	9	25	44	20

5   Conclusion

Our study has shown that the poverty-inducing effect of *time deficits* that individuals and household encounter in meeting their household production requirements is, in fact, substantial. Not taking this factor into account renders many households' inability to meet basic needs invisible:

- Some, especially the employed, fall outside the radar of policy - these are the 'hidden poor'.
- For others the difficulty arises in that their depth of poverty is largely underestimated, and current *levels* of interventions cannot truly lift them out of poverty.
- For yet another group, those with incomes that hover near and around the LIMTIP poverty threshold, the risks and vulnerabilities they face are indiscernible by official poverty measures. Idiosyncratic or systemic shocks are bound to create hardships for them.

Our framework provides a lens that makes these vulnerabilities evident, observable, and measurable. We have also shown that poverty-inducing deficits in household production are not uniformly distributed across households and individuals. Gender, the presence of young children and employment status, among other differences, matter a lot. Hence, this study reinforces the idea that when remedial policies are contemplated, one size does not fit all. Finally, we have shown that policy interventions that aim at job creation are unlikely to be effective for a sizeable

number of the income-poor. Thus, if policies are not in place to counteract time deficits and dismally low wages, many individuals and women, in particular, will remain excluded from the promise that remunerative work holds.

Despite widely differing economic conditions and social and economic policy regimes across the three countries in our study, we are able to identify overarching themes in terms of poverty-reduction strategies that effectively and simultaneously address both time and income poverty. Most importantly, two groups present in large numbers in all three countries, the working poor and the nonemployed, must be approached very differently in terms of policy interventions. It is worth highlighting the following findings and their implications.

5.1   The Working Poor

As we have seen, a substantial number of the poor in all three countries in the study are actually working or in households in which at least one adult is working. Thus their situation is frequently characterized not only by lack of income, but of time as well. From a gender perspective, the fundamental policy concern here is that the "male breadwinner" model is being reconstituted and reinforced by the labor market realities faced by women and men. More often than not, among poor households it does not "pay" for women to be full-time workers, due to a combination of wage differentials and precarious work for women, men working very long hours for slightly better pay, and the lack of vigorous decent job creation for all. A number of policy interventions might be useful to alleviate the deprivation suffered by the working poor and the gender inequity faced by women and we summarize several of them here.

First, public action to alleviate the burdens of time and income poverty can and should be based on alliances that cut across the gender line, since our estimates indicate that workers suffering from income and time deficits were divided nearly equally across the sexes and included the middle class and even the upper-middle class in Mexico. In this respect regulation of the length of the working day is important for all workers, but more so for men, whose hours of employment are 20-30 hours longer than those of women, with some of them reaching 60 to 70 weekly hours of employment.

Second, women workers formed the majority of the group that was the worst-off according to our measure: members of income-poor households, individually time-poor, and belonging to the

bottom of the earnings distribution. Therefore, improvement of overall gender equity requires an integrated three-pronged agenda. Moving gradually towards full-time paid work for women will help alleviate the income deficits they face. Making early childhood development and after school programs available, will both make full-time employment possible, but also relieve women's time deficits. Ameliorating gender pay disparities will help make full-time work a better option for income-poor women.

Third, the higher vulnerability of working parents—men and women—and households with young children to income and time poverty makes clear the need to augment income-support programs and/or greatly expand in-kind social provisioning of child care and early childhood development programs. The latter also need to offer hours of operation that are appropriate for the work schedules of parents and especially of women.

Fourth, in light of the fact that it is over-optimistic to expect that gender-equitable redistribution of intrahousehold responsibilities is easily achievable in these three countries, the co-responsibility of the state in care provisioning is central to enabling women to allocate more time to employment. For women who are currently not employed or underemployed, the creation of job opportunities must be accompanied by active policies that reduce their household production time deficits.

Finally, our findings suggest a need for deepening the policy dialogue on a critical issue. In fighting income poverty (time adjusted) there are two obvious policy routes. The first is unconditional cash transfers, which can close LIMTIP income gaps, especially if transfer levels are based on accurate calculations of the depth of poverty. The alternative requires a much more transformative approach that is based on institutional labor market interventions. The cornerstone here is the reduction of gender-based wage differentials, the progressive realization of living wages, and a regulatory framework for effectively reducing long hours of paid work.

5.2   The Nonemployed Poor

Given that a large portion of nonemployed adults were women with children under 18 years of age and only a high school degree or less, employment policies that do not take into account these crucial features of the employable adults in income-poor households are likely to be less

effective in terms of poverty alleviation, and the need for early childhood care and afterschool programs we discussed above is clearly equally pertinent here.

Second, because full employment can produce a dramatic reduction in the incidence of income poverty even without altering the current structure of earnings, efforts to steer economic development toward inclusive growth via policies that encourage employment generation are clearly central to poverty alleviation. This creates space for innovative and flexible "employment guarantee" policies. These policies are helpful when labor market conditions are slack, in that they effectively put in place a wage floor, regulation of work hours, and a minimum benefit package while providing part time employment.

Third, the fact that the LIMTIP poverty rate was as high in the full employment simulation as the actual (i.e., pre-simulation) official poverty rate indicates that increases in employment would have to be accompanied by much of what was discussed earlier for the case of the working poor: labor market legislation (e.g., higher minimum wages); redistributive policies to expand social care provisioning; government cash transfers; creation of jobs that pay living wages.

Fourth, the fact that half or more of the hardcore poor consisted of the hidden poor indicates that using the official poverty measure to monitor the impact of job creation on poverty alleviation can leave a substantial portion of the working poor off the radar of policymakers.

Finally, the fact that the majority of the employable adults moved to full-time employment in the simulation were mothers means that if early childhood development services were to be made available, the time deficits mothers are likely to encounter with full-time employment would be ameliorated and, at least for some, an exit from income poverty would be facilitated.

Our study has highlighted the jobs deficit (lack of job opportunities), earnings deficit (the inability of a substantial segment of employed households to attain an income above the poverty line), and the deficit in the social provisioning of care and other essential services, such as transportation, that interact to keep a considerable proportion of the population locked in the grip of poverty. A coherent set of interlinked interventions that address the triple deficit of jobs, earnings, and social provisioning must lie at the core of any inclusive and gender equitable development strategy that is worth its name. Public action and public policy cannot afford to wait for positive outcomes to magically "trickle down," nor can social development interventions be

expected to deliver on the promise of poverty reduction in light of the interlocking nature of the triple deficits identified above.

Appendix A Statistical matching

For each country in the study, the surveys are combined to create a synthetic file using constrained statistical matching (Kum and Masterson 2010). The basic idea behind the technique is to transfer information from one survey ('donor file') to another ('recipient file'). Such information is missing in the recipient file but necessary for research purposes. Each individual record in the recipient file is matched with a record in the donor file, where a match represents a similar record, based on several common variables in both files. The variables are hierarchically organized to create matching cells for the matching procedure. Some of these variables are used as strata variables, i.e., categorical variables that we consider to be of the greatest importance in designing the match. For example, if we use sex and employment status as strata variables, this would mean that we would match only individuals of the same sex and employment status. Within the cells, we use a number of variables of secondary importance as match variables. The matching progresses by rounds in which strata variables are dropped from matching cell creation in reverse order of importance.

The matching is performed on the basis of estimated propensity scores derived from the match variables. For every recipient in the recipient file, an observation in the donor file is matched with the same or nearest neighbour based on the rank of their propensity scores. In this match, a penalty weight is assigned to the propensity score according to the size and ranking of the coefficients of strata variables not used in a particular matching round. The quality of match is evaluated by comparing the marginal and joint distributions of the variable of interest in the donor file and the statistically matched file (see Masterson, 2011 for a detailed description of the statistical matches).

Appendix B Accounting for hired domestic help in Mexico

Households can meet their household production needs via their own labor and hiring domestic help. Methodologically, it is important to address the issue of hired domestic help in a time-

income poverty measure such as ours. However, there was no information on hired domestic help in either the Argentinian or Chilean data that we used. In Mexico, the time-use survey did contain useful information in this regard. The data indicated that about 7 percent of all households in Mexico used hired domestic help. We were, therefore, able to account for hired domestic help in our estimates of LIMTIP for Mexico.

In our measure, we need to account for both the time and income effect of hiring domestic servants. We included the hours of domestic help in deriving the threshold hours of household production. Domestic servants, of course, cost money, and therefore represent a drain on the income available to the household for other expenditures. This needs to be taken into account in gauging the income poverty status of households.

While alternative approaches are possible here, we employed an intuitive and simple method that is based on an assessment of how much hired help contributes to meeting the threshold hours of household production. Obviously, if the household did not hire any domestic help, the contribution is zero and no adjustment needs to be made to its income. This is also the case if the total hours spent by the household members equal or exceed the threshold hours of household production. In households where hired help did contribute toward meeting its threshold hours of household production, we took as the amount of contribution the *minimum* of (a) the difference between the threshold hours and the household's own hours and (b) the hired hours. Denoting R_j^* as the contribution, R_j^o as the 'own' hours of household production and R_j^h as the hired hours of domestic help, we can write:

$$R_j^* = 0 \text{ if } R_j^o \geq \bar{R}_j \text{ or } R_j^h = 0$$
$$= \min\left(\bar{R}_j - R_j^o, R_j^h\right) \text{ otherwise}$$

We used the hourly wage of domestic workers in the urban and rural areas (see below), depending on the household's location, to calculate the expenditures for R_j^* and deducted the expenditures from the household's income. In the LIMTIP, the adjusted measure of household income was employed to determine the household's income poverty status.

Appendix C Microsimulation model

The simulation is a two-step procedure (a fuller explanation as well as results of the simulation are available in Masterson 2012). The first step is imputing the industry, occupation, earnings and the hours of work of those to be assigned jobs ('recipients'). The second step is to impute the new shares of household production in households affected by job assignments. We defined a pool of individuals who were eligible to 'donate' their earnings and hours in the hot-decking procedure described below. This donor pool contained adults aged 18 to 74 who were employed full-time (25 hours or more per week).

We determined the likeliest industry and occupation for each of the recipients using a multinomial logit procedure. Both industry and occupation are regressed on age, sex, marital status, education, and relationship to household head in the donor pool. The likelihood for each industry and occupation is then predicted in the recipient pool, using the results of the multinomial logit. Then each recipient, except those actually working part-time, is assigned the likeliest industry and occupation using those predicted likelihoods.

In order to assign earnings and hours, we first employed a Multistage Heckit procedure. The entire procedure was done separately for each combination of six age categories and sex (and in Mexico, urban/rural status). The first stage is a probit estimate of being employed full-time with the following explanatory variables: indicators for the presence of male and female children aged less than one, one to two, three to five, six to twelve, and thirteen to seventeen in the household, number of children in the household, education, marital status, and spouse's age and education.

We use the results of the regression to generate the Mills ratio, which, in turn, we use to control for bias when we estimate wages and hours of work in the following stages. We first regress the log of hourly wages of donors on age, education, marital status, and industry and occupation as well as the Mills ratio obtained in the prior step. Using the results of this set of regressions, we predict the wage for the recipients and donors. The predicted wages are then used, along with the same set of regressors used in the wages regressions, to estimate regressions for the usual weekly hours of employment of donors. Using the results of this set of regressions, we predict hours of employment for the recipients and donors. The imputed wages and hours are used in the hot-decking procedure, described below, to assign earnings and usual hours of work.

In the third and final stage of the earnings and hours assignment process, we use a multiple imputation with hot-decking procedure. In this type of process, missing values (in this case the earnings and hours of jobs that we have assigned in the first stage) are replaced with those from individual records that are 'most like' the individual with the missing values. We use a weighted affinity score to assess 'likeness.' We weight industry and occupation most heavily, followed by imputed wages and hours. We also use individual and household characteristics (household type, marital status, spouse's labour force status, indicators for the presence of male and female children aged less than one, one to two, three to five, six to twelve, and thirteen to seventeen in the household, and, number of children) though these are weighted less heavily. We run this procedure within the age-sex cells used throughout this process. Donors are picked randomly from the subset of individuals most like each recipient record, until all recipients have been assigned hours and earnings. The new monthly earnings of individuals were used in calculating the new amounts of household income, based on the assumption that the income sources other than earnings remain unchanged.

As we indicated before, we assume that the time use pattern of each individual in the households that contain one or more job recipients would change. We use a second round of hot-decking to assign new weekly hours of household production to each of these individuals, based on updated labour force participation variables for the recipients of jobs in the first stage. The donors in this round were all full-time workers who were in a household in which each eligible adult was working full-time. The method of hot-decking used in this round is the same as in the previous round, with the exception of the matching variables used and their relative weighting in the procedure. In this round, the variables used to assess nearness of match are household type, marital status, spouse's labour force status, indicators for the presence of male and female children aged less than one, one to two, three to five, six to twelve, and thirteen to seventeen in the household, number of children in the household, number of adults in the household, household income, the income share of each individual,[27] and the two imputed variables from the first stage: earned income and usual weekly hours worked. Household income and labour force status are updated to reflect the increased earnings and the new job assignments received in the previous stage. The number of children and number of adults in the household, household

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[27] This is included to reflect changes in bargaining power within the household and its impact on the distribution of household production work.

income, and income share are the most heavily weighted variables. Next are household type, updated earned income, usual weekly hours of work, and labour force status, followed by marital status and spouse's labour force status, then the variables relating to children in the household. Once we ascertained the weekly hours of household production of the individuals in the households that contain one or more job recipients, we could then readily calculate each individual's share in the total household production performed by their household.

The revised hours of household production (for individuals who are now assumed to be employed full-time and their household members) and hours of employment (for individuals who are now assumed to be employed full-time) would result in a change in the amount of time deficit faced by the individuals and households affected in the simulation. In some cases, this would result in an upward revision in their modified income poverty threshold. The effect of the changes in household income, time deficit and modified income poverty threshold is reflected in the changes in the LIMTIP of affected households.

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