Working paper

International Growth Centre

Is there an urban wage premium in Rwanda?

Jonathan Bower
Sakshi Gupta
Carlo Menon

January 2021

When citing this paper, please use the title and the following reference number:
C-20061-RWA-1

DIRECTED BY LSE UNIVERSITY OF OXFORD

FUNDED BY UKaid from the British people

Is there an urban wage premium in Rwanda?

Jonathan Bower[†], Sakshi Gupta[‡], and Carlo Menon[*]

January 27, 2021

Abstract

This paper uses household data from Rwanda to analyse the urban wage premium and urban consumption premium. We find that both nominal wage and nominal consumption of workers in Rwanda are significantly higher in urban areas than in rural areas - and correlate to city size - even when individual characteristics are controlled for. This implies some form of agglomeration effect inherent to Rwanda's cities. We also find evidence that rural-urban migrants undergo a learning process in which their wage increases as they gain more experience in the city; however this result does not hold for consumption which is higher even in the first two years of living in a city, implying resource transfer. The urban wage premium is positive and significant for women in both Kigali and secondary cities, but lower than for men in Kigali. When the unemployed (those who work for less than an hour per week) are included, the wage premium is negative and significant, but the consumption premium remains positive. The evidence we find in this paper confirms the importance of the urbanisation process for productivity and wage growth, and our findings have implications for how, and where, Rwanda seeks to harness urbanisation to drive growth through urban investments.

[†]Country Economist International Growth Centre Rwanda team
[‡]Ph.D. Student, Economics, Columbia University. E-mail: sg3511@columbia.edu
[*]Research Director, Laterite, Kigali

1 Introduction

Like many other primate cities in developing countries, Rwanda's capital, Kigali, is growing rapidly (Bower and Murray, 2019), and is by far the largest engine of productivity and growth in the country (Rajashekar et al., 2019). Whilst Kigali's household incomes are higher and poverty incidence is lower than in other parts of the country, new migrants to the city often experience precarious housing conditions and difficulty in accessing decent jobs. In this context, it is unclear whether rural-urban migration can deliver net gains for the majority of new migrants and spur aggregate growth. Given Kigali's rapid growth and primacy, both of which are very high in international terms, an interesting question is whether Kigali is getting "too large"; in other words, whether the benefits of agglomeration economies are being overcome by the demons of density such as congestion, overcrowding, and crime. Another interesting question is the size of the urban wage premium of secondary cities in relation to Kigali: secondary cities are far smaller and less connected than Kigali, so do they generate a premium? If so, how does it compare to the Kigali premium?

A growing literature has found that urban wages are consistently higher than rural wages for like individuals - a phenomenon known as the "urban wage premium". Whilst evidence shows that cities in many parts of the world increase productivity and consumption, it is less obvious whether this is the case for African cities. Page et al. (2020) document a range of challenges that African cities face that may harm productivity: they tend to be spatially fragmented and have poor levels of accessibility, high costs relative to their level of development, and slow industrial growth relative to cities on other continents.

Our paper attempts to fill an evidence gap for Africa on rural-urban productivity differences. We estimate the nominal urban wage and consumption premium for Rwanda by exploiting high-quality data from three waves of the Integrated Household Living Conditions Survey (EICV), covering the period 2011-2017. We contribute to the literature by adding to the few studies that examine the urban wage premium in developing countries (Colombia (Duranton, 2016), India (Hnatkovska and Lahiri, 2012), Brazil (de Oliveira Cruz and Naticchioni, 2012), and India, China and Brazil (Chauvin et al., 2017); we are only aware

of one paper on Africa, by Jones et al. (2017), which covers Uganda, Tanzania and Nigeria. In spite of a workable panel being unavailable for Rwanda, we xploit a variable in the data to examine the impact of the duration of residence in a city after migration from a rural area. This allows us to analyse for the first time how learning contributes to the urban wage premium in a low-income country, complementing the extant literature that focused on high-income countries (for example Glaeser and Mare (2001) for the US, Matano and Naticchioni (2016) for Italy and De la Roca and Puga (2017) for Spain).

Our results show that both nominal wage and nominal consumption of workers in Rwanda are significantly higher in urban areas than in rural areas, even when individual characteristics are controlled for. The wage premium correlates with city size; whilst it is statistically significant for secondary cities too, it is largest for Kigali. We also find evidence that rural-urban migrants undergo a learning process in which their wage increases as they gain more experience in the city. On average, the urban wage premium is zero in the first two years after migration takes place, but rises steeply in the following years. Moreover, we find that consumption per adult equivalent in the household in which the individual lives is much higher than in rural areas even in the first two years in the city, implying that they receive support either from a host urban household or from transfers from family members. Robustness tests show that unlike in Uganda, Tanzania or Nigeria (Jones et al., 2017), the urban wage premium is positive and significant for women in both Kigali and secondary cities, but lower than for men in Kigali. They also show that when the unemployed are included, who do not receive a wage, the higher unemployment in cities than in urban areas makes the urban wage premium negative and significant, except for men in Kigali in the latest survey round, 2017, who continue to see a positive and significant premium. Reassuringly, the urban consumption premium remains positive and significant even when the unemployed are included, and the consumption premium may even be larger for women. Whilst these premia are large in nominal terms, in the absence of data on price differences between rural and urban areas we cannot know the extent to which these premia translate into real wage differences.

The influential report "Future Drivers of Growth" (Government of Rwanda and World Bank, 2020) considers urbanisation to be an important source of economic growth that Rwanda

should seek to maximise through good urbanisation policy. The evidence we find in this paper confirms the importance of the urbanisation process for productivity and wage growth, and our findings have implications for how, and where, Rwanda seeks to harness urbanisation to drive growth through urban investments. A caveat is in order: Rwanda's urban wage and consumption premia are not the only important metrics on the economics of the urbanisation process: to get a full picture, other important measures include the absolute difference between urban and rural poverty, the path of real wages over time in urban and rural areas, migration patterns from rural to urban areas and urban job market trends; World Bank (2020) deals comprehensively with this wider context.

The paper is structured as follows: section 2 describes the economic significance of any urban wage premium results for Rwanda, section 3 reviews the literature, section 4 describes our data and methods, section 5 gives results, and section 6 concludes.

2 What is the economic significance of an urban wage premium for Rwanda?

Almost all countries, especially developing countries, have higher wages in urban areas than in rural areas (Bryan et al., 2019). This implies that urban areas are generally more productive than rural areas. There are two possible reasons for this. First, workers with higher productivity – perhaps stemming from higher education or ability - may leave rural areas and go to cities either because they are attracted to the greater amenities that cities offer, or because of greater demand for their skills; this is known as "spatial sorting" in the literature Combes et al. (2008). This has the implication that larger cities will not make workers, or the country, more productive. Second, cities may be inherently more productive places that benefit from agglomeration economies. There are a large number of theories as to what might drive these agglomeration economies; a seminal paper by Duranton and Puga (2004) splits these theories into three categories: the larger scale of cities enables sharing of indivisible inputs often with high fixed costs, and sharing of gains from specialization and variety; cities

enable better matching of workers to firms, or firms to firms; and cities facilitate learning, through knowledge generation, diffusion and accumulation.

To separate the effect of spatial sorting from the effect of agglomeration economies, we need to control for the characteristics of workers. If workers with equal ability, education and other socioeconomic characteristics earn more in urban areas than non-urban areas, we can conclude that cities are in fact more productive. These productivity-affecting characteristics can be split into observable characteristics that can be controlled for in a dataset, such as gender, years of education, age and other factors, and unobservable characteristics – in particular, ability and perhaps health. A cross-sectional panel of data at one point in time can control for observable characteristics, but controlling for unobservable characteristics requires a panel dataset that includes a sufficient number of individuals who move from rural to urban areas, so that their wages can be compared before and after the move. Whilst we have three rounds of cross-sectional household data at the individual level in Rwanda, we do not have access to data on which individuals moved from rural to urban areas, so our analysis is confined to controlling for observable characteristics. However, we do attempt to find proxies that enable us to control for ability.

A final important question is whether cities increase real wages and thus have welfare and poverty-reducing benefits for those who migrate. Glaeser and Mare (2001) argue that real wages should be significantly higher in cities in which spatial sorting plays a role. We are unable to calculate real wage differences for rural and urban areas due to data constraints as described in section 4.1. Our analysis is thus limited to analysis of nominal urban wage premium.

Understanding exactly what mechanism makes cities more productive would be an important first step to produce policy implications. However, the effects of different mechanisms behind agglomeration economies (such as sharing, matching and learning) are often observationally equivalent and difficult to empirically identify and separate (Duranton and Puga, 2004). However, one interesting mechanism we are able to test in this paper is whether cities increase rural-urban migrants' productivity over time and hence foster learning, a topic we explore in more depth below.

Table 1 gives illustrative examples of possible interpretations of findings of a low or high wage premium for Kigali or for secondary cities and other urban areas, which hint at the economic significance of our findings for Rwanda and how we should interpret the results. Clearly there is significance for urbanisation policy in terms of budget planning for infrastructure investment and spatial and land use planning, and the decision of whether investments should be channeled more towards Kigali or secondary and satellite cities. The results would also hint at the consequences of urbanisation for spatial distribution of income and wealth in the country over time. Variables that are excluded here for brevity, but that we include in our analysis, are the dynamic movements of an urban wage premium over time, gender dimensions of the premium, learning and the real wage premium (which we do not have the data to calculate).

3 Literature review

The rural-urban wage gap is a well-established stylised fact in urban economics, and it is usually larger in developing countries. Ciccone and Hall (1996) find that a doubling of employment density increases labour productivity in the US by 6 percent, and Glaeser and Gottlieb (2008) and Ahlfeldt and Pietrostefani (2019) have similar findings across multiple countries. Ferré et al. (2010) find an inverse relationship between poverty and city size in eight developing countries.

A core question of interest is whether if rural poor or rural workers move to the city, they become better off. As noted, if cities simply attract the most productive workers with the best skills, ability and ambition, then they will do little for the poor or unskilled. Combes et al. (2008) estimate the extent to which higher wages in France can be attributed to the sorting of high productivity workers into cities, and the extent to which higher wages can be attributed to place-specific characteristics. They find that individual skills account for a large portion of spatial wage disparities, but that employment density is also an important factor.

Bryan et al. (2014) wrote a compelling paper on migration dynamics that captures the benefits of rural-urban migration in ways unrelated to individual worker productivity, but

Table 1: Illustrative economic interpretations of different results on urban premia

Urban wage premium		Example of possible economic interpretation
Kigali	**Secondary cities and other urban areas**	
high	low	Migration to Kigali, and investments that promote it, will enhance productivity and growth the most, and we can be fairly confident that the current high level of migration is good for economic growth. Secondary cities and other urban areas enhance the productivity of rural migrants to them, but to a lesser extent than Kigali. Policies should seek to enhance the productivity-boosting properties of secondary cities and other urban areas. However, investments might be weighted towards Kigali for maximum growth benefit and possibly also maximum poverty alleviation benefit if those investments can spur sufficient creation of jobs accessible to rural migrants.
low	high	Migration to secondary cities and other urban areas, and investments that promote it, will enhance productivity and growth the most – and policies should aim to speed up migration to these urban areas. Kigali enhances the productivity of rural migrants to it, but less than secondary cities and other urban areas. Policies should seek to enhance the productivity-boosting properties of both Kigali and secondary cities and other urban areas. However, investments might be weighted towards secondary cities and other urban areas for maximum growth benefit and possibly also maximum poverty alleviation benefit if those investments can spur sufficient creation of jobs accessible to rural migrants.
high	high	An equally high urban wage premium in Kigali and other secondary cities, would lend confidence that migration to all areas increases productivity; policymakers should weight investments (assuming decreasing returns to those investments) equally for maximum growth benefits
low or non-existent	low or non-existent	Neither Kigali nor Secondary Cities are increasing productivity of rural migrants; policymakers should seek to find ways to enhance the productivity of all urban areas but especially those that show the most promise.

also captures the benefits of migration to the rural family of origin. The authors conducted a randomized experiment in which they paid households in a famine-prone part of Bangladesh to send a seasonal migrant to an urban area. A small incentive led to a sizeable increase in the number of migrants, and the household that was given the incentive was more likely to send migrants in future years. Moreover, migration increased food and non-food expenditures of migrants' family members remaining at the origin by 30–35 percent, and improved their caloric intake by 550–700 calories per person per day. Earnings of migrants at the destination are much higher than at the origin, but the authors are coy about full attribution, although they conclude that "migration in this setting is very profitable and in some sense underutilized" in part due to the risk and cost involved in an attempt at migration.

Chauvin et al. (2017) find that "in India the gap between urban and rural wages is huge, but the correlation between city size and earnings is modest". They also find that in poorer countries, limited migration and rental housing market distortions limit the extent to which migration can conform to a spatial equilibrium in which all gains from migration are exhausted, which is consistent with the findings from Bryan et al above. Hicks et al. (2017) use fixed effects estimates to find that urban workers in Indonesia earn 3 percent more per hour whereas those in Kenya earn fully 26 percent more. Alesina et al. (2019) and Perlman (2010) find that urbanisation is highly related to intergenerational upward mobility.

There are very few papers that examine the urban wage premium in Africa. The closest paper to ours, regionally and methodologically, is one by Jones et al. (2017) in which they estimate the urban wage premium for Uganda, Tanzania and Nigeria. They find strong evidence that an urban wage premium exists, and is not primarily driven by spatial sorting but by agglomeration effects. Interestingly, and in a finding we can directly compare with this paper, they find that the urban wage premium is only significant for men and is largest for the primate city of each country. Some secondary cities had a non-existent wage premium. Henderson and Kriticos (2018) build on Jones et al. (2017) and also find significant nominal urban wage premiums, largest for the primate cities and smaller for secondary cities; they also attempt to get at a measure of the real urban wage premium by finding the impact of urbanity on rent costs, rightly noting that "our data on African cities does not offer enough

to do the more full blown analysis that is done on some countries" – which is also the case for Rwanda. They find that it tends to raise cost of living by 17 percent compared to an 18-28 percent urban wage premium and a premium of 28-49 percent for Kampala, implying that higher costs in urban areas wipe out a significant proportion of urban real income gains.

Another interesting strand of the literature that relates to analysis we conduct in this paper, finds that the urban wage premium is driven by learning over time. In a pioneering 2001 paper, Glaeser & Mare find that in the US most of the urban wage premium accrues over time as a result of greater skill accumulation in cities, and that this learning effect is stronger in more skilled areas. In a follow-up paper, Glaeser and Mare (2001) find that in the US most of the urban wage premium accrues over time as a result of greater skill accumulation in cities, and that this learning effect is stronger in more skilled areas. In a follow-up paper, Glaeser et al. (2009) continue to find that cities and skills are complements. Matano and Naticchioni (2016) disaggregate this narrative and find that in Italy, whilst skilled workers benefit from a high wage premium as soon as they migrate, consistent with a "coordination" hypothesis in which they simply find markets for their skills, lower skilled workers benefit more from wage growth over time, which is consistent with a "learning" hypothesis. In a paper analysing the wage premium in Spain, De la Roca and Puga (2017) find that sorting plays a minor role, that workers in bigger cities do not differ based on unobserved ability and that workers experience an immediate static premium – implying factors other than learning behind agglomeration economies. However, they also find that around half of the urban wage premium then accrues again as workers gain experience in cities, and that these workers take these gains with them when they relocate. Finally, they find that higher ability workers benefit more from bigger cities.

4 Data and methods

4.1 Data sources

The final database used for the analysis is obtained by combining three waves of the Rwandan Integrated Household Living Conditions Survey, administered by the National Institute of Statistics of Rwanda (NISR), and known with its French acronym (EICV - Enquête Intégrale sur les Conditions de Vie des ménages). The EICV in its current form was administered in 2010/11 (EICV 3), in 2013/14 (EICV 4), and in 2016/17 (EICV 5), and is a very comprehensive and high-quality source of data. Each wave cover a nationally representative sample of around 14,000 households, accounting for around 64,000 individuals. The survey covers the following topics: consumption, poverty, housing conditions, education, economic activities including agriculture, housing, access to services.[1] While a panel version of the database - which tracks a sub-sample of households across the three waves - has been produced, it is currently not accessible to us. Therefore, our analysis is limited to the pooled sample of the three cross sections, which means that we cannot observe changes for the same households over time. The identification of urban premiums is thus derived from the comparison of otherwise similar individuals in rural and urban locations, respectively, at each given point in time.

4.2 Variable definition

In Table 2 we list all variables used in the analysis and their definitions. We assess the magnitude of the urban premium on the following variables: wage and consumption per adult equivalent. Wage is expressed as the daily wage[2] that the individual received from the job she was engaged in at the time of the survey.[3] The consumption per adult equivalent is the total

[1] For a detailed description of the EICV, see NISR (2018)

[2] The wage is winsorized at the top i.e. all values greater than the 99th percentile are replaced by the 99th percentile.

[3] In case there were more than one such job, we consider the job from which she earned the maximum per day wage.

consumption expenditure of the household in the past 12 months divided by the number of adult equivalent members in the household.[4]

Table 2: Variable definition

Variable	Definition
Urban	1 if resides in urban area, 0 otherwise
City Size Category	Small (less than 30k); Mid-sized (between 30k and 200k); large (more than 200k)
Log Wage	Log of per day wage received by individual from the job she was engaged in at the time of the survey
Log Consumption (per ae)	Log of total household consumption per adult equivalent in the last 12 months
Female	1 if gender is female, 0 otherwise
Migrant	1 if not always lived in the district currently interviewed in, 0 otherwise
Province	Kigali, Southern, Northern, Eastern and Western
Marital Status	Indicator for whether individual is married or single
Age Categories	16-70 year old divided into 9 year age categories (e.g 16-24,25-33,...,62-70)
Education	1 if Secondary or University education, 0 otherwise
Read	1 if able to read a simple note, 0 otherwise
Write	1 if able to read a simple note, 0 otherwise
Written Calculation	1 if able to perform a simple written calculation, 0 otherwise
Computer Use	1 if reports confident in using computer, 0 otherwise
Log Hours	Log of hours worked last week in the current job from which the respondent earned maximum per day wages
Job Experience	Months of experience in the current job from which the respondent earned maximum per day wages
Industry	Industry classification of the current job from which the respondent earned maximum per day wages
Occupation	Occupation classification of the current job from which the respondent earned maximum per day wages
Sector	Sector associated with the current job from which the respondent earned maximum wages in the last week

Nominal and real wage are the variables that are commonly used in the related literature to assess the existence of an urban premium. Nominal wage not only provides information about potential welfare gains to individuals, but provides also suggestive evidence on productivity gains to firms (at least in the tradable sector): if such gains were absent, then

[4]The consumption per adult equivalent is winsorized at the top i.e. all values greater than the 99th percentile are replaced by the 99the percentile.

firms and businesses would not find it profitable to locate in cities where wages and rents are higher (Jones et al., 2017). To assess the impact of living in an urban area on individuals' welfare, however, ideally we would need to use real wage, to take into account that living costs, especially housing, are typically higher in cities. To the best of our knowledge, there is no publicly available consumer price index that can be used to deflate nominal wages to make them comparable between rural and urban areas, which would enable an assessment of the urban (real) wage premium. A promising avenue for future research would entail using spatially disaggregated price data (potentially from Ministry of Agriculture) to create an appropriate price index that can be used to infer variation in real wages between rural and urban areas and thus the urban (real) wage premium.

As a dependent variable, wage does have a number of shortcomings (Meyer and Sullivan, 2003). First, it may suffer from a large measurement error in rural areas, where many people are self-employed or practice subsistence agriculture. Second, it may be highly volatile, especially in urban areas, especially if people experience frequent short spells of unemployment. Third, it is known that respondents often tend to misreport their wage in survey interviews. Therefore, we complement our analysis by using consumption expenditure per adult equivalent as an second outcome variable. We expect this measure to be less prone to misreporting, and also less volatile, due to intertemporal consumption smoothing in which households save in good times and spend in bad times to sustain a level of welfare. However, similarly to wage, this measure also suffers from a lack of detailed price data, as we are unable to assess the extent to which the difference in consumption expenditure between rural and urban areas reflects welfare differences or simply differences in prices.

4.3 Descriptive evidence on the characteristics of Rwanda's rural, urban, and migrant populations

Table 3 shows general descriptive statistics for Rwanda's population. On this measure, the rate of urbanisation increases from 14.3% to 18.4% between 2011 and 2017. The percentage of the population classified as "not poor" rises from 55.1% to 62.3% in the same period.

Kigali Province increases from 9.4% to 13.7% of Rwanda's population between 2011 and 2017, whereas the Northern Province decreases from 18.5% to 15.5%. Nominal aggregate consumption per adult equivalent nationally rises from 254,981 RWF in 2011 to 353,937 RWF.

Table 3: Descriptive Statistics (Households)

	EICV3	EICV4	EICV5
Urban	14.27	16.61	18.45
	(34.98)	(37.22)	(38.79)
Extremely Poor	24.12	16.33	15.73
	(42.78)	(36.97)	(36.41)
Moderately Poor	20.79	22.78	21.94
	(40.58)	(41.94)	(41.38)
Not Poor	55.09	60.88	62.33
	(49.74)	(48.80)	(48.46)
Kigali Province	9.373	11.10	13.71
	(29.15)	(31.41)	(34.40)
Southern Province	23.63	23.30	23.03
	(42.48)	(42.28)	(42.10)
Western Province	24.19	23.32	22.58
	(42.82)	(42.29)	(41.81)
Northern Province	18.48	15.88	15.48
	(38.81)	(36.55)	(36.17)
Eastern Province	24.34	26.40	25.21
	(42.91)	(44.08)	(43.42)
Aggregate consumption/ae (RWF)	254981.0	289152.0	353937.4
	(334750.6)	(356323.0)	(368162.2)
Observations	14308	14419	14580

mean coefficients; sd in parentheses

*$p < 0.05$, *$p < 0.01$, *$p < 0.001$

In Table 4 we report some descriptive statistics of the sample under scrutiny, from EICV 3, EICV 4 and EICV 5 pooled together. People living in Rwanda's cities tend to be more skilled than those in rural areas: around 44% of the urban population has secondary or higher education compared to 16% in rural areas. The urban population is also more likely to be able

to read and write a simple note and perform a written calculation. In addition to that, the greater possibility of exposure to technology in urban areas may also lead more people to be confident in using a computer compared to rural population. These differences in skills coexist with higher expected wage earnings in urban areas for those who are able to secure a job. In both urban and rural regions, almost 50% of the population is engaged in waged or salaried jobs, but the average per day wage/salary earned by an individual is more than 1.5 times larger in urban areas. This is partially counterbalanced by a higher likelihood of being unemployed in cities: while virtually nobody reports unemployment in rural areas, 5% of urban workers are unemployed (see Table 3). The nominal value of aggregate consumption is also much higher in urban areas, by a factor of three. Two caveats are due on these unemployment figures: first, they are from well before the COVID-19 pandemic, which raised unemployment significantly, and second, they have also been updated by various Labour Force Surveys; these figures thus represent the characteristics of individuals in the three datasets used for this survey according to EICV definitions, rather than the most current and definitive unemployment figures for Rwanda.

One of the benefits of the EICV survey is that it collects detailed information about migration, including the reasons for migration. The upper graph in Figure 1 shows reasons for migration of the working age population in Rwanda across years. Employment-related reasons (which include employment opportunities, loss of employment or lack of employment) are prominent, and gained importance over time. Pull factors such as employment opportunities seem to drive the majority of the movement due to employment related reasons.

The upper graph of Figure 1 presents the different reasons for migration across the three waves of EICV; employment was the reason for migration for under a fifth of migrants in EICV 3 rising to around a quarter of all migrants in EICV 5. Although informative, this aggregation of different types of migrants masks a lot of heterogeneity. Thus in Figure **??**, for a pooled dataset of all three EICV waves, we plot the reasons for migration cited by different groups based on their past and current destination. While employment-related reasons motivate around 48% of our sample moving from rural to urban areas, only 14% of the rural to rural migrants report them to be decisive factors in their movement. Additionally, among those who

Table 4: Urban vs. Rural

Variable	(1) Urban N	(1) Urban Mean/SE	(2) Rural N	(2) Rural Mean/SE	T-test Difference (1)-(2)
Female	19162	51.2	87656	53.9	-2.7***
		(0.4)		(0.2)	
Age (Years)	19162	31.1	87656	34.0	-2.9***
		(0.1)		(0.0)	
Secondary or university education	16418	42.6	67735	15.2	27.4***
		(0.4)		(0.1)	
Read	17985	88.3	84458	72.6	15.7***
		(0.2)		(0.2)	
Write	14784	97.7	56050	94.6	3.1***
		(0.1)		(0.1)	
Written Calculation	16914	87.6	79560	70.3	17.3***
		(0.3)		(0.2)	
Confident in Computer Use	17473	26.7	76958	4.8	21.9***
		(0.3)		(0.1)	
Unemployed	19162	4.7	87656	0.3	4.4***
		(0.2)		(0.0)	
Avg Per Day Wage (RWF)	8999	2720.2	42734	950.5	1769.7***
		(34.9)		(5.5)	
Max Per Day Wage (RWF)	8999	2792.6	42734	1002.6	1790.1***
		(35.3)		(5.7)	
Avg Per Day Wage* (RWF)	6274	3150.5	14588	1256.4	1894.1***
		(52.0)		(14.3)	
Max Per Day Wage* (RWF)	6274	3163.1	14588	1260.0	1903.1***
		(52.3)		(14.4)	
Aggregate consumption/ae (RWF)	19162	791459.1	87656	247361.7	544097.3***
		(5054.4)		(753.4)	

Notes: The value displayed for t-tests are the differences in the means across the groups. Observations are weighted using variable HH_WT as aweight weights.***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

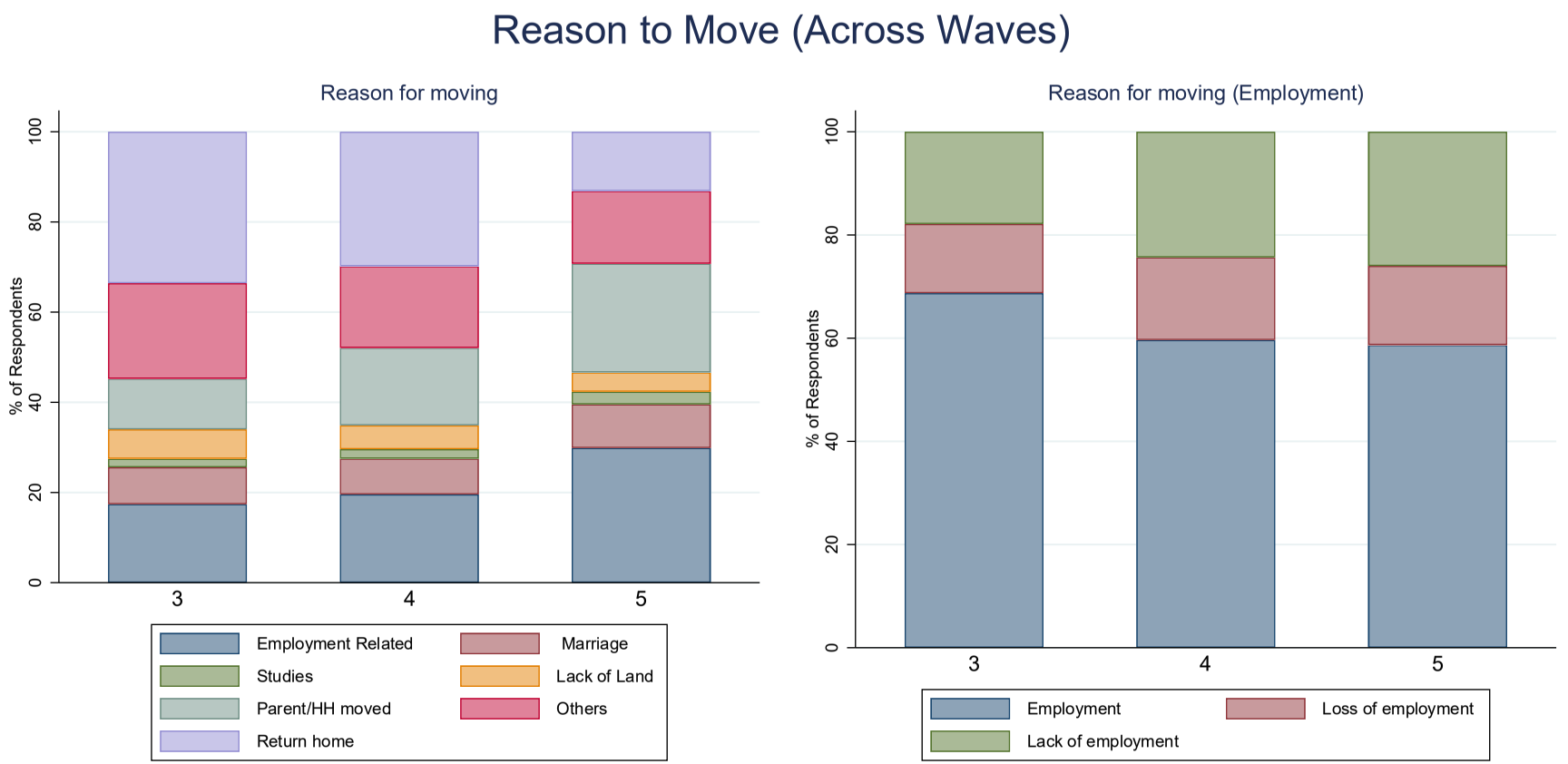
migrate to urban areas for employment related reasons, more than 80% report pull factors like employment opportunities as driving factors – as opposed to loss or lack of employment, although it is unclear whether this entails employment opportunities that are reasonably anticipated, or merely hoped for.

In Table 5 we then look at differences between rural-urban migrants and those who stay in rural areas.[5] Consistent with Table 4, the statistics suggest that those who migrate to cities are relatively younger and more skilled than rural stayers. If a migrant is able to secure a job in the city, her earnings are expected to be higher on average. However, not everyone who migrates to cities is successful. The likelihood of being unemployed among rural to urban migrants is 4% compared to 1% among rural stayers. This might induce return migration to rural areas. From Figure **??** we can see that employment related reasons are as important for people moving from one big city or town to another as for return migrants. Nonetheless, a major difference is that people moving from urban areas to other urban areas are attracted by employment opportunity, but for those returning from urban to rural areas, the push factors of lack of employment opportunities and loss of employment are dominant reasons for migration. In Table 6 we compare those who migrated from rural to urban areas with those who returned back to rural areas from cities. Return migrants to rural areas are more likely to be older and less skilled compared to those who decide to stay back in cities. They are also less likely to be unemployed, but this is primarily because they are more likely to be engaged in independent farming when they go back.

The discussion in this section suggests that difference in wages between cities and rural areas coexists with skill differences. Thus, the urban wage premium may be partly driven by sorting of skilled people into large cities, or it may be the case that cities inherently lead to better productivity due to agglomeration effects. To better understand these differences and channels and to quantify the urban-rural wage premium, we use the econometric models described in the next section.

[5]This includes those who never migrated from rural areas and those who migrated from one rural to another rural destination.

Figure 1: Reasons to Migrate (Migrant Type)



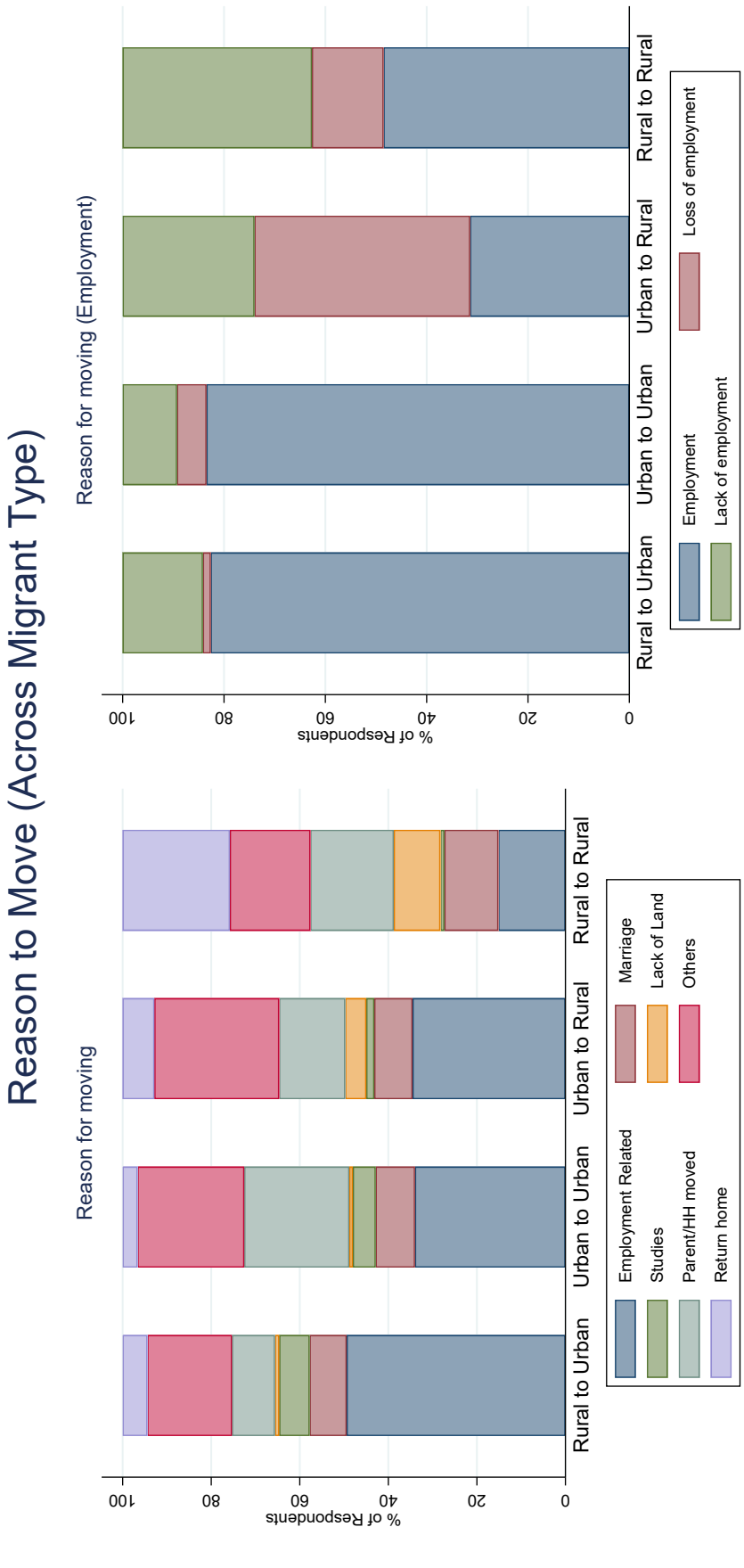

Reason to Move (Across Migrant Type)
Reason for moving
% of Respondents
0
20
40
60
80
100
Rural to Urban
Urban to Urban
Urban to Rural
Rural to Rural
Employment Related
Studies
Parent/HH moved
Return home
Marriage
Lack of Land
Others
Reason for moving (Employment)
% of Respondents
0
20
40
60
80
100
Rural to Urban
Urban to Urban
Urban to Rural
Rural to Rural
Employment
Lack of employment
Loss of employment

Table 5: Urban Migrants vs Rural Stayers

Variable	(1) Rural to Urban Migrant N	(1) Rural to Urban Migrant Mean/SE	(2) Rural Stayer N	(2) Rural Stayer Mean/SE	T-test Difference (1)-(2)
Female	6342	51.1	73264	54.7	-3.6***
		(0.6)		(0.2)	
Age (Years)	6342	30.4	73264	33.6	-3.2***
		(0.1)		(0.1)	
Secondary or university education	5436	33.9	55858	14.3	19.6***
		(0.6)		(0.1)	
Read	5962	87.2	70285	71.8	15.4***
		(0.4)		(0.2)	
Write	4735	97.6	45693	94.5	3.0***
		(0.2)		(0.1)	
Written Calculation	5480	86.8	65763	69.6	17.2***
		(0.5)		(0.2)	
Confident in Computer Use	5696	18.8	63140	4.2	14.6***
		(0.5)		(0.1)	
Unemployed	6342	3.9	73264	0.3	3.6***
		(0.2)		(0.0)	
Avg Per Day Wage (RWF)	3453	1976.1	35415	883.9	1092.2***
		(41.1)		(5.1)	
Max Per Day Wage (RWF)	3453	2050.3	35415	934.2	1116.1***
		(41.9)		(5.4)	
Avg Per Day Wage* (RWF)	2611	2105.9	11785	1131.5	974.4***
		(55.2)		(13.3)	
Max Per Day Wage* (RWF)	2611	2118.6	11785	1134.8	983.8***
		(55.7)		(13.3)	
Aggregate consumption/ae (RWF)	6342	802136.1	73264	237708.7	564427.3***
		(8395.4)		(763.6)	

Notes: The value displayed for t-tests are the differences in the means across the groups. Observations are weighted using variable HH_WT as aweight weights.***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 6: Return Migrants

Variable	(1) Rural to Urban N	Mean/SE	(2) Urban to Rural N	Mean/SE	T-test Difference (1)-(2)
Female	6341	51.1	6639	47.1	4.0***
		(0.6)		(0.6)	
Age (Years)	6341	30.4	6639	34.0	-3.7***
		(0.1)		(0.2)	
Secondary or university education	5435	33.9	5718	20.0	13.9***
		(0.6)		(0.5)	
Read	5961	87.2	6448	82.4	4.8***
		(0.4)		(0.5)	
Write	4734	97.6	4893	95.4	2.2***
		(0.2)		(0.3)	
Written Calculation	5479	86.8	6072	79.5	7.3***
		(0.5)		(0.5)	
Confident in Computer Use	5695	18.8	6096	10.3	8.5***
		(0.5)		(0.4)	
Unemployed	6341	3.9	6639	0.8	3.1***
		(0.2)		(0.1)	
Avg Per Day Wage (RWF)	3452	1976.1	3587	1555.6	420.5***
		(41.1)		(35.0)	
Max Per Day Wage (RWF)	3452	2050.3	3587	1630.1	420.2***
		(41.9)		(35.5)	
Avg Per Day Wage* (RWF)	2610	2105.9	1525	2215.8	-109.9
		(55.2)		(77.5)	
Max Per Day Wage* (RWF)	2610	2118.6	1525	2221.4	-102.8
		(55.7)		(77.8)	
Aggregate consumption/ae (RWF)	6341	802136.2	6639	344900.3	457235.9***
		(8396.1)		(4382.7)	

Notes: The value displayed for t-tests are the differences in the means across the groups. Observations are weighted using variable HH_WT as aweight weights.***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

4.4 Econometric models

To measure the urban wage premium we apply econometric methods that have been widely used in the relevant literature. The standard approach consists of running a linear regression at the level of individual workers, in which the dependent variable is a measure of wage, and the main variable of interest is the total population of the urban agglomeration in which the individual lives. Other control variables are included to take into account the roles played by education, work experience, and demographic factors in determining the individual's wage. If both the wage and population variables are expressed in logarithmic form, the regression coefficient can be interpreted as the elasticity of wage with respect to urban population. In most applications, the sample is limited to the urban population.

$$y_{ik} = \alpha + \beta * UrbanPopulation_k + \Gamma * X_i + \epsilon_i \tag{1}$$

where i indexes individuals, and k indexes places. *UrbanPopulation* is a continuous variable that identifies the size of the urban agglomeration in which the individual i lives; and X is a set of control variables at individual level, including education, demographic factors, and job experience (see Table 2). The dependent variable y is a measure of either wage per individual, or consumption per adult equivalent in the household in which the individual lives, as discussed above.

This approach, however, has two main limitations. First, it is typically limited to individuals who live in urban areas; this is because the model normally takes the log of the urban population in which the individual lives, which is zero in rural areas, but log of zero is undefined meaning that rural individuals cannot be included in the analysis. Thus, this approach is not informative of differences in wage between the urban and the rural population. Second, the approach in equation 1 may fail to capture a non-(log) linear relationship between wages and urbanisation. Therefore, to address both limitations, we estimate a different regression model using both the urban and rural sample and allowing for the relationship between the dependent variables and urban population to be non-linear. The only difference with Equation 1 is that the continuous urban population variable *UrbanPopulation* is replaced

with a categorical variable *UrbanGroup*, which classifies the Rwandan territory as follows: rural areas; small cities (agglomerations) between 10,000 and 30,000 inhabitants, mid-sized cities (municipalities) with between 30,000 and 200,000 inhabitants; and large cities with over 200,000 inhabitants – of which there only example in Rwanda is the primate city Kigali; these classifications follow Rwandan urban planning law. The model is the following:

$$y_{ik} = \alpha + \beta * UrbanGroup_k + \Gamma * X_i + \epsilon_i \tag{2}$$

The model is estimated with Ordinary Least Squares (OLS) and includes population weights to produce nationally-representative estimates. Standard errors are clustered at the level of the cluster unit used for sampling.

As discussed in section 2 and 3, the control variables at individual level play a crucial role in partialling out the sorting component of the urban wage premium. If cities attract more qualified and educated workers, then not controlling for these factors would lead to an overestimation of the urban productivity premium. However, to the extent that the urban environment contributes to generating part of the education, skills, and job experience endowment – for instance, when individuals who move to the city become more educated or skilled as a result - these variables may be intermediate outcomes, and therefore should be considered as "bad controls" (Angrist and Pischke, 2008). Using these "bad controls" would thus lead to an underestimation of the urban premium; thus cities may increase wages through two channels: a direct increase in wages for the same skill set and an increase in the skill set itself which increases wages in turn. Given that we cannot fully observe in the data the extent to which education, job experience, and skills are acquired in the city, we add a robustness test that exclude these controls; the resulting coefficient should be considered an "upper bound" of the urban premium, while the model with the full set of control should be considered a "lower bound" (or conservative) estimate.

However, controlling for education, work experience and skills does not fully rule out the risk that those who tend to move to cities may have higher ability in unobserved ways that increase their wages or consumption level (Johnson, 1953; Glaeser and Mare, 2001). Not

including unobserved ability in the model may lead to an overestimation of the urban wage premium. In the literature, this issue is typically addressed with the inclusion of individual fixed effects, which implies that the model estimation process is able to isolate the variation over time in the outcome and explanatory variables for the same individuals. Such a model can be estimated only with a panel sample in which the same set of individuals are tracked over time - and the urban wage premium can be estimated only on individuals that changed location over the observed period (i.e., internal migrants).[6] This approach has been adopted by Glaeser and Mare (2001) and Combes et al. (2008) but has a demanding data requirement; Jones et al. (2017) attempted but abandoned this approach for Nigeria, Tanzania and Uganda due to inconsistent results as well as small and unrepresentative sample sizes of internal migrants in their data.

We then address the question of whether workers experience a "learning" effect as they stay in urban areas – that is, over time they acquire education, skills, and experience in urban areas that affect their wages and consumption per adult equivalent in their household. To do so we estimate a third model in which the main regressor of interest is a categorical variable, *MigrationGroup* that classifies individuals into the following groups: rural stayers, urban stayers, and rural-urban migrants according to their "seniority" in the city: less than two years, three to four years, five to six years, seven to eight, nine to ten, and more than ten. The remainder of the model is identical to Equation 2:

$$y_{ik} = \alpha + \beta * MigrationGroup_k + \Gamma * X_i + \epsilon_i \tag{3}$$

Finally, we use the same model to explore the mechanisms through which learning takes place. In this case, the dependent variable is not the wage, but a measure of skills that migrants can acquire in cities and that are expected to affect wage.

[6] In section 6 we discuss how this analysis could be expanded along these directions if the panel version of the EICV is made available to us.

5 Results

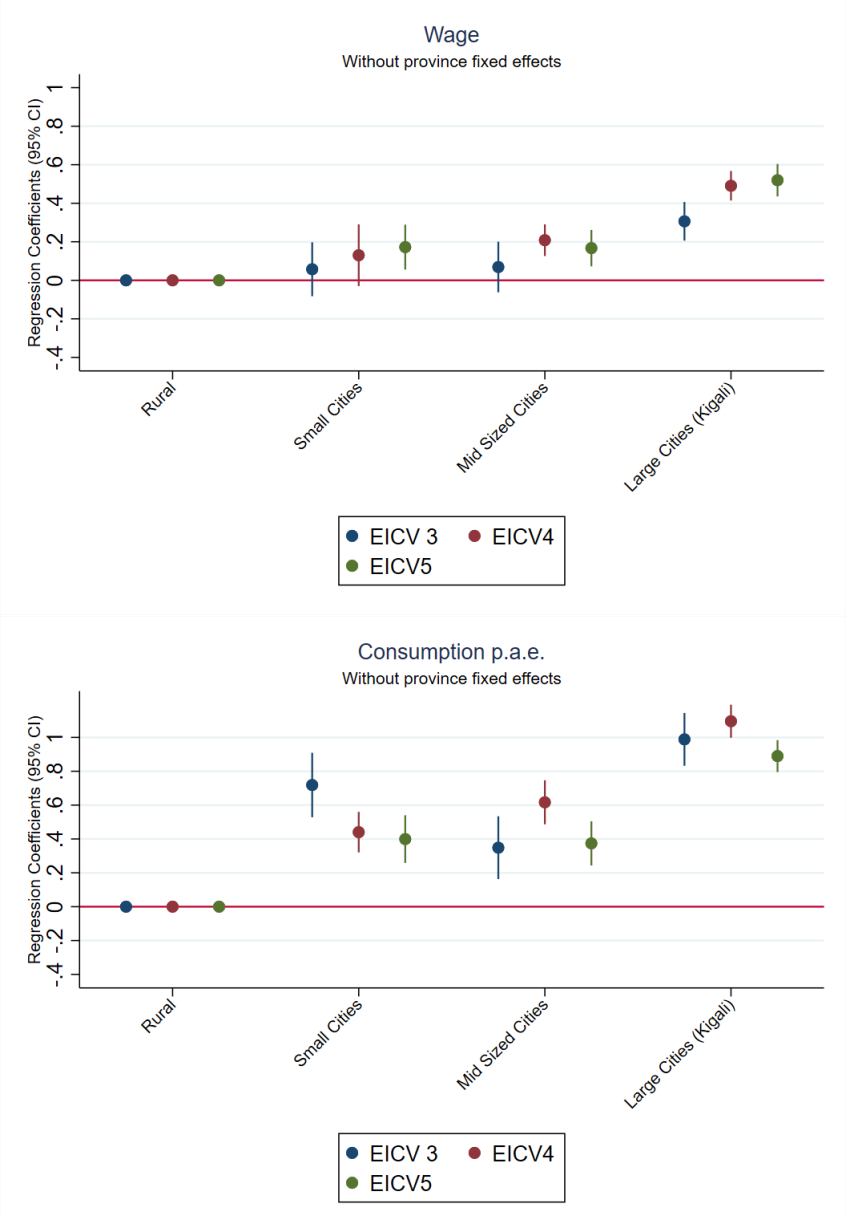
In this section we summarise the main findings from the empirical analysis. We first estimate the urban wage premium, with a special focus on the role of Kigali vis-a-vis secondary cities. We then exploit the available information on duration of migration to explore how long the urban premium takes to materialise - i.e., the "learning" process - and we also attempt to identify some learning mechanisms.

5.1 The urban premium and its evolution over time

We begin by estimating the model reported in Equation 1, which regresses wage and consumption on a continuous population variable. Results from EICV 4 and EICV 5 - available upon request - point to a coefficient of 0.15 representing an increase in 1.5% in wages for a 10% increase in city population. The effect is roughly three times larger than that found in industrialised countries (Ciccone and Hall, 1996; Glaeser and Gottlieb, 2008; Ahlfeldt and Pietrostefani, 2019). Whilst we have noted the shortcomings of this approach, we add this specification because it is comparable to the one most often seen in the literature. In this model, the sample is restricted only to urban population; meaning that most of Rwanda's population, which is rural, is excluded as explained in section 4.4. The small number of cities in Rwanda, a country of 12 million people, dictates caution in interpreting these results.

We then estimate the model in Equation 2. According to this model, The urban wage premium appears to have consolidated over time in Rwanda, especially for secondary cities (Figure 2, top). Using the most recent data, i.e., the EICV5 survey administered in 2017-18, our estimates show that nominal wages are 16-17% higher in small and mid-sized cities, and 71% higher in the primate city Kigali, once workers' observable characteristics are controlled for. The estimates are very similar for the 2013/14 period (EICV 4), while differences are smaller and significant only for Kigali for the 2010/11 period (EICV 3). Compared to the estimates of **?** for Uganda, the effect that we find is roughly similar in magnitude for secondary cities, but much larger for the primate city.

Figure 2: Urban premium - categorical variables



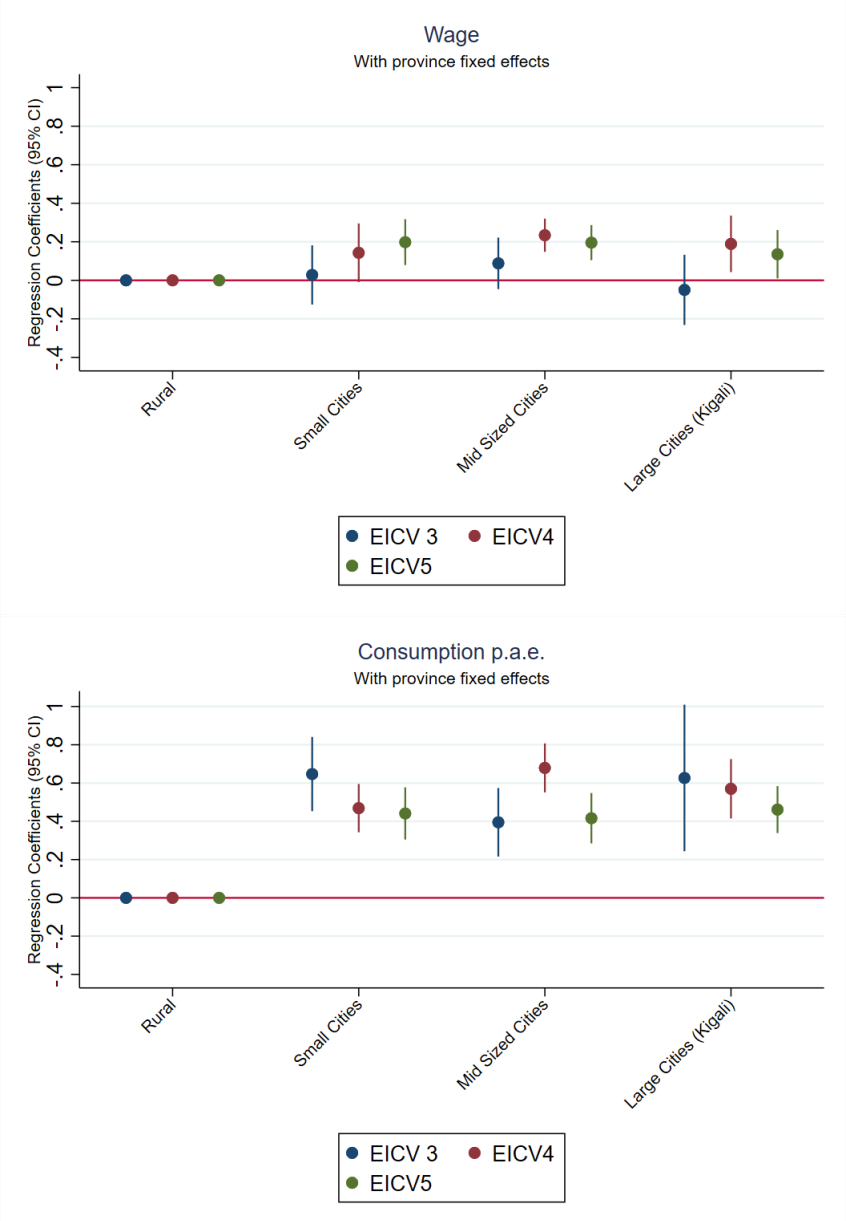
Note: The graphs plot the coefficients obtained from the specification of Equation 3. All regressions also include controls for age, gender, education, marital status, migrant status, hours worked, years of work experience, and skills. See Table 2 for a detailed variable definition. The whiskers indicate 95% confidence intervals. Standard errors are clustered at the sampling cluster level.

Consumption data reveal larger differences between cities - including small towns - and rural areas (Figure 2, bottom). Consumption expenditures are around 50% higher in secondary cities, and around 160% higher in Kigali, than in rural areas. Differences are overall quite stable over time, and, differently from wage, are significant also in the EICV3. While part of these higher expenditures are likely to be explained by higher prices of non-tradable goods, as discussed before, consumption data provide a clear indication that urban dwellers have a much stronger purchasing power than their rural counterpart. Higher coefficients may also indicate that consumption is a more precisely measured variable than wage, as typically coefficients on variables that have a measurement error are biased toward zero.[7]

In this first battery of estimates, Kigali has a much larger premium than secondary cities. We then proceed to include province fixed effects to control for the average wage and consumption levels within the same province. In this configuration, the urban wage premium can be interpreted as the difference between wage levels – or consumption levels – in urban and rural areas within the same province. When province fixed effects are included, the wage and consumption premium of Kigali is comparable - or even slightly smaller - to those of secondary cities (Figure 3). This means that the Kigali wage premium is partly, in effect, a "Kigali Province" premium: the higher wages and consumption in urban Kigali city extend to significant extent to rural areas within the same province, and workers in rural areas in the Kigali province experience much higher wages and consumption levels than comparable workers in rural areas in other provinces. Kigali Province is large at 730 square kilometres, and analysis by Rajashekar and Bower (2020) confirms that population densities are highly unequal across the city, and that large swathes of the province are rural. Our finding is therefore consistent with findings from Cali and Menon (2013), who show that the benefits of urbanisation spread out to the surrounding rural areas.

[7]This is referred to as the "attenuation bias" in the econometric literature; see e.g. Angrist and Pischke (2008)

Figure 3: Urban premium - categorical variables with province fixed effect



Note: The graphs plot the coefficients obtained from the specification of Equation 3. All regressions also include controls for age, gender, education, marital status, migrant status, hours worked, years of work experience, and skills. See Table 2 for a detailed variable definition. The whiskers indicate 95% confidence intervals. Standard errors are clustered at the sampling cluster level.

5.2 Learning and succeeding in cities

As noted, analysis in Glaeser and Mare (2001) and De la Roca and Puga (2017), finds that learning in cities is the primary channel through which the urban premium materialises. In particular, when workers arrive in urban areas, they do not experience much immediate increase in their wages but do experience faster wage growth. Moreover, Glaeser and Mare (2001) find that higher wages do not disappear when workers leave cities. This pattern is consistent with faster learning in cities. In the literature, however, empirical investigations of the learning channel are rare and almost non-existent in developing countries, as they have the demanding requirement of individual-level longitudinal data with detail on wage, individual characteristics, and location.

Whilst we do not have access to such a dataset, we were able to innovate by exploiting a survey question in EICV on the year in which the individual moved to their current location which allows us to examine this channel. The results are summarised in Figure 4 and 5. The outcome variables are regressed on nine different categories of migrants; these include six categories of rural-urban migrants according to their length of stay, plus two additional categories for people who never migrated and are in rural or urban areas, respectively (rural stayers and urban stayers), and a category for people who returned to rural areas after having been a rural-urban migrant (return migrants). Rural stayers are the excluded benchmark category, so the coefficient is zero for this category, and all other coefficients are expressed as the average wage difference from the rural stayers group. In all other aspects, the specification mirrors those presented above, and they include control variables for age, gender, education, and marital status.[8] Unlike the previous specifications, however, all the three EICV waves are pooled together, in order to ensure to have enough observations in each migration category.

The estimates show that for all categories, nominal wage is significantly higher than that of rural stayers, except that of urban migrants in the first two years after the migration event (Figure 4). The plot also shows that the wage premium is roughly increasing with the duration of migration, although differences are not statistically significant, and the trend is not very

[8]We excluded those control variables that could be an outcome of the learning process in the city: work experience, hours worked, and skills.

solid. The evidence that the wage premium is negative in the first two years suggests that migrants need to undergo a sort of "investment" of a negative urban wage premium before they can capitalise on their migration and receive a higher wage. This is also consistent with the evidence reported in section 4.3 that more than half of urban-rural migrants return home (see Table 6). Taken together, these figures suggest that the non-trivial share of the rural-urban migrants who decide to return home, do so after having struggled to obtain a better-paid job in the city. It is also interesting to note that consistently with Glaeser and Mare (2001), return migrants have a higher wage than rural stayers - although still lower than urban migrants, except the most junior ones. A reasonable interpretation of this result may be that return migrants obtain some learning in the city that continues to benefit them when they return to rural areas. However, this may also due to sorting: those who attempt to migrate have a higher level of unobserved ability than those who do not attempt, and this is reflected in their higher wage, even after their return. Further exploration of this issue with an identification strategy robust to selection effects would be an interesting avenue for future research.

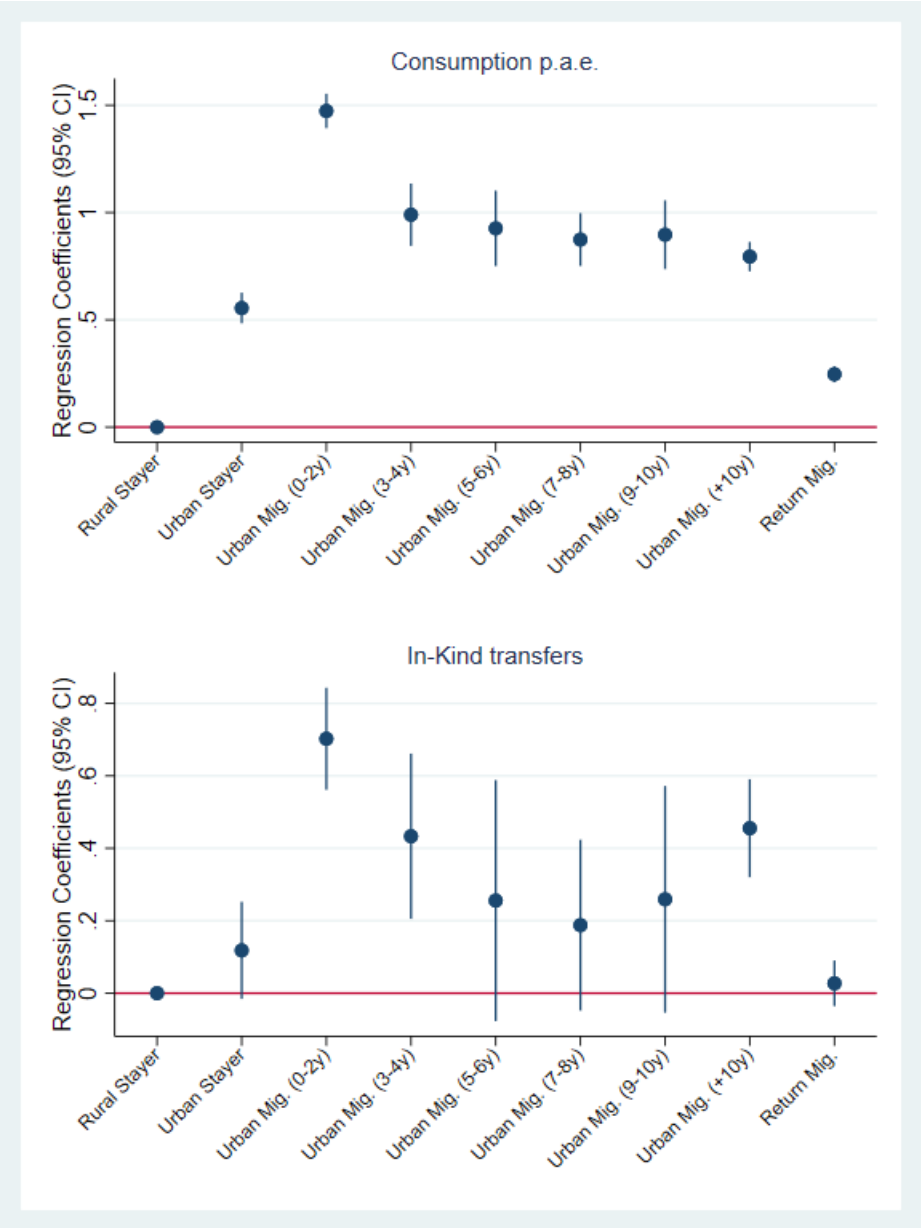
Figure 4: Urban premium by migration seniority: wage

Note: The graphs plot the coefficients obtained from the specification of Equation 3. All regressions also include controls for age, gender, education, marital status. See Table 2 for a detailed variable definition. The whiskers indicate 95% confidence intervals. Standard errors are clustered at the sampling cluster level.

Interestingly, the results for estimation of consumption per adult equivalent as the dependent variable (Figure 5, top) show a different pattern compared to wage. All categories enjoy a higher consumption level than rural stayers, including migrants in the first two years, who actually enjoy a much higher consumption level than all other categories, in stark contrast with the results on wage. There are at least three possible explanations. First, rural-urban migrants may move into existing households that have the capacity to support them, and thus consumption per adult equivalent is higher. Second, consumption in the first year may be higher because it is funded from savings – which may also involve the purchase of more durable goods than in a typical year because the migrant has moved house. Third, financial and in-kind transfers from family members in other households may be higher for a rural-urban migrant, possibly with the expectation that the migrant will then compensate with remittances once settled down and employed in the city. The explanation may be an interesting area for further research as, jointly with the suggestive evidence that a large share of migrants "fail" to integrate in the city and return home, this finding might have important implications for migration policy.

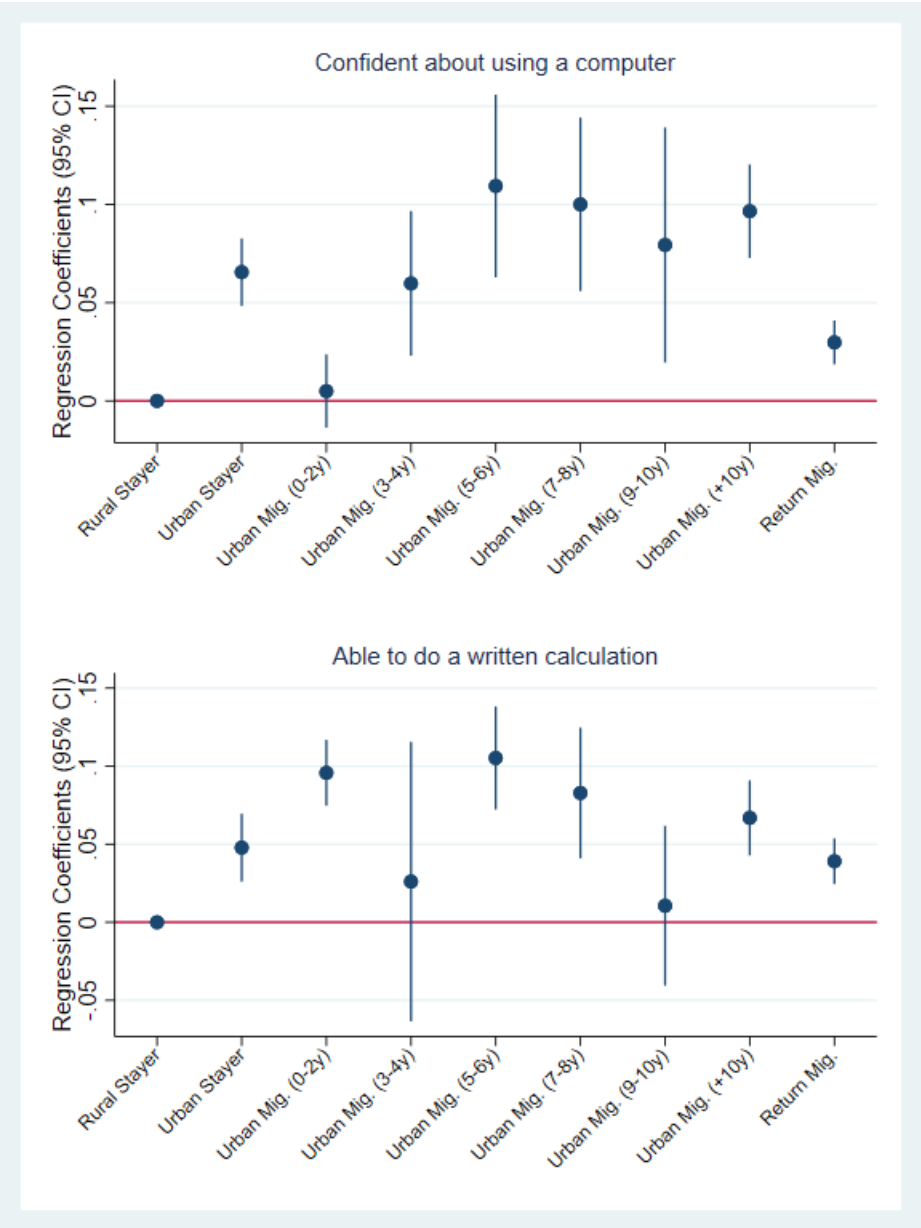
To further explore whether the positive association of wage with urban seniority is due to learning, we exploit two questions of the EICV survey that assess two important skills in the labour market: being able to do a written calculation, and being confident about using a computer. As reported in Table 4, in the EICV 5 sample 87.8% of urban workers declare the ability to do a written calculation, and 27.2% feel confident about using a computer. In Figure 6 we visualise the results from a regression of the probability of having those skills on urban seniority, controlling for the usual set of background characteristics (including education). The plot for computer literacy (top) looks quite similar to the one for wage in Figure 4: all urban categories have a higher probability to (declare to) be computer literate than rural dwellers, except for "early" migrants (within the first two years), for which the probability is not statistically different from their rural counterpart. Computer literacy, therefore, appears to be a "learning" channel through which urban migrants progressively obtain an urban wage premium. This result might also explain the return migration phenomenon: not being able to learn how to use a computer may contribute to failing to find a good job in the city, and

Figure 5: Urban premium by migration seniority: consumption p.a.e. and transfers



Note: The graphs plot the coefficients obtained from the specification of Equation 3. All regressions also include controls for age, gender, education, marital status. See Table 2 for a detailed variable definition. The whiskers indicate 95% confidence intervals. Standard errors are clustered at the sampling cluster level.

Figure 6: Urban premium by migration seniority: skills



Note: The graphs plot the coefficients obtained from the specification of Equation 3, except with the relevant skill as the dependent variable. All regressions also include controls for age, gender, education, marital status. See Table 2 for a detailed variable definition. The whiskers indicate 95% confidence intervals. Standard errors are clustered at the sampling cluster level.

opt to return to a rural village. However, the pattern is not confirmed by the plot for the ability to do a written calculation: while all urban categories have higher probabilities than rural stayers, there are not statistically significant differences across urban categories.

5.3 Robustness

We run a range of robustness tests. First, we include the unwaged. In the data sample used for the main results, we only include individuals who earn a wage for at least one hour per week[9], but do not include the unwaged. However, we now go on to include this subgroup in our sample, in order to estimate the average urban wage premium for every individual including the unemployed[10]. In our sample, less than 1% of rural residents consider themselves unemployed, probably because farming is always available, but 5% of urban residents are unemployed[11]. Our results show that the urban wage premium not only disappears when the unemployed are included in the sample, but turns negative and significant; however, as will be discussed in the second robustness test, for men, the wage premium remains positive and significant, if smaller, for urban Kigali in EICV 5.

This is consistent with two possibilities: some unwaged workers may be involved in independent business activity in which they are not paid a regular wage but instead, take home some profit[12]; and the 5% of unemployed workers cannot obtain any work in the urban areas. On the latter point, analysis shows that many rural-urban migrations fail and the migrant returns to the rural area because of loss of employment (Bundervoet et al., 2017). Moreover, whilst World Bank (2020) found that the increase in the proportion of jobs in off-farm labour between 2011 and 2017 reduced poverty, it then found multiple signs of softening off-farm labour markets between 2011 and 2017, in which job creation by new establishments fell behind the annual increase in the labour force of 240,000. The study also found a fall in

[9]Whilst our main results do not include the unwaged, our result finding an urban wage premium may thus be robust than the results in Jones et al. (2017), who only include those who work more than twenty hours per week.

[10]It is only mathematically possible to do this by setting all wages that are zero, equal to 1 RWF, because the dependent variable is log of daily wages and log of zero is mathematically undefined.

[11]These figures are different to the unemployment figures in Rwanda's Labour Force Survey data because unemployment is measured differently.

[12]The way that questions in the EICV questionnaires are structured are consistent with this possibility.

off-farm real wages, and an above-average rise in the percentage of the working age population that is unemployed and seeking work for those in the top two income quintiles.

For our second robustness test, we add unwaged workers to estimate whether an urban premium exists for consumption per adult equivalent. Respondents report their consumption pattern irrespective of their employment status, and consumption is never zero, so unlike for wages, no mathematical workarounds are required. Therefore, we run a robustness test including the unwaged in the consumption regressions, both in the estimations on urban premium and learning in cities. Contrary to the results for wages, the results for consumption are almost identical to those in the main results. Thus, even for the unemployed, moving to an urban area increases the nominal value of consumption per adult equivalent – and the phenomenon of increased consumption in year 0-2 of a rural-urban move noted in the main results, continues to hold. As already argued, this is consistent with the four possible reasons elaborated in section 5.2: rural-urban migrants may move into better-off households that have more ability to support the additional family member; consumption may be higher in the first year due to moving house; financial and in-kind transfers from family members, and independent business activities rather than work for a wage.

Our third category of robustness tests relates to gender. Jones et al. (2017) find that the urban wage premium is significant only for male workers in Uganda, Tanzania and Nigeria. For wage, we find that when excluding the unwaged as in the main result, there is a positive and significant wage premium for both men and women, but this premium is 32 to 50 percent lower for women in Kigali than for men. However, the wage premium for women is not statistically significantly different from the premium for men for small and mid-sized cities. If we include the unwaged, as noted in the first category of robustness tests above, there is still a positive urban wage premium for men in the largest cities at least for EICV 5 in 2017, but the premium for women is statistically significant and negative; this is consistent with more women than men being unwaged, perhaps due to family responsibilities. In stark contrast, for consumption, women fare better than men: the urban consumption premium remains positive and significant, but is over 30 percent higher for women than for men; this holds whether the unwaged are included or excluded.

Our fourth robustness test is to exclude education and skills from the model. We mentioned above that some of the controls included in the regressions to neutralise the sorting effect - namely education, skills, and job experience - may be "bad controls", as they may be intermediate outcomes of the urban premium (education and skills may improve due to a move to the city). Skills, in particular, is a source of concern as the learning regressions do show that some learning is taking place after migrating to the city. We therefore compare the results from the baseline specifications with those obtained excluding those controls. As expected, points estimates are indeed around 10 percent higher, but the main conclusions and, in most cases, significance levels are unaffected.

6 Conclusion

In this paper we examine the urban wage premium in Rwanda and find that both nominal wages and nominal consumption per adult equivalent are higher in urban areas; this relationship is much stronger for Rwanda than for developed countries. In particular, for individuals with similar characteristics, wages are between 31% and 52% higher in Kigali than Rwanda's rural areas,[13] and 13% to 21% higher in Rwanda's small and mid-sized cities (in EICV 4 and 5; it is lower in EICV 3), a finding which is in line with the correlation between wages and city size found in the literature. We also find that the urban wage premium has risen over time for Kigali, from 31% in 2011 to 52% in 2017; it has also strengthened for small and mid-sized cities. The urban premium for consumption per adult equivalent is even more striking: 89% to 110% higher for Kigali and 35% to 72% higher for secondary cities, although its trend over time is less clear.[14]. However, urban premiums for both wages and consumption drops significantly in Kigali when we control for the average level in the same province, while they maintain a similar level in secondary cities. This implies that the large Kigali premium is actually a province-level premium, which means that the wage and consumption-increasing effects of urban Kigali spread to the rural parts of the province.

[13]This an approximation from log points to percentage.

[14]Even if urban consumption levels remain constant over time, an increasing proportion of people living in urban areas has still contributed to an increase in average consumption and reduction in poverty nationally

We then examine the urban wage premium based on duration in the city, to find that urban wages are similar to rural wages for the first two years, but increase greatly over time until migrants have been in the city for 7-8 years. This can be interpreted as a learning effect of being in cities and supports a central hypothesis of Glaeser and Mare (2001), but in a developing country context. We also found that (self-reported) computer literacy, but not the stated ability to do a written calculation, increases with duration in the city, and thus appears to be a "learning" channel through which urban migrants progressively obtain an urban wage premium. However, we do not find that consumption per adult equivalent increases with urban seniority, which could be the case for a number of reasons; this topic warrants further research. Return urban-rural migrants also earn more so appear to retain the benefits of their experience in the city.

In the first of a series of robustness checks, we include the unwaged in the sample – who comprise an average of 5% of the urban population for all three EICV wages compared to a rural average of 1% - and find that the urban wage premium turns negative and significant, except for men in urban Kigali in 2017. However, our findings on an urban consumption premium hold just as strongly, showing that even when the unemployed or unwaged are included, a move to cities significantly increases consumption. The findings on wages are consistent with the finding that many migrants try to enter cities, but fail to find sufficient employment and return home (Bundervoet et al., 2017). We also find that those remain in the city must undergo a period of "investment" in which they earn low wages and must be supported in a household with consumption levels high enough to sustain them, but their wages generally increase over time. Our findings point to a need for further research on the pattern of resource transfers around the rural urban migration process.

On gender, we find, unlike Jones et al. (2017) for Uganda, Tanzania and Nigeria, that the urban wage premium is statistically positive and significant for both women and men, although it is 32% to 50% lower for women than for men in Kigali. However, where the unwaged are included, it is always negative and significant for women. The urban consumption premium, however, is higher for women than for men whether the unwaged are included or not. We also find that excluding education and skills from the model – which allows the impact of

urbanisation on education and skill level - increases the urban wage premium slightly, as expected.

One important question is whether cities increase real wages and thus have welfare and poverty-reducing benefits for those who migrate. This is not granted, as real wages might be higher in cities due to spatial sorting of high ability individuals into urban areas - i.e., only wealthier rural people move to the cities. Due to data constraints, We are unable to track individuals over time to calculate real wage differences as they move from rural to urban areas. However, we do include a wide sets of control variables on skills, experience, and education that should neutralise a significant share of unobserved heterogeneity in the composition of the urban and rural population. As the nominal urban wage premium is not affected, we conclude that comparable workers in cities are more productive than their rural counterparts in Rwanda.

Taken together, these findings suggest that migration to Kigali, and investments that promote it, continues to reduce poverty and increase consumption of migrants; it may also enhance national productivity and growth, provided that jobs can be created fast enough. It is certainly the case that the expansion of Kigali has made its rural periphery much richer. Our evidence shows also that secondary cities do enhance the productivity of rural migrants too, but to a lesser extent than Kigali. Therefore, to maximise growth and poverty alleviation, urban policies and investments should seek to enhance the productivity-enhancing properties of all urban areas, but might be weighted towards Kigali for maximum economic benefit. Moreover, given the significance of urban unemployment, and the learning benefits that urban jobs - or at least continued residence in a city - appear to confer, any urban policies and investments should seek to incorporate a strong job creation objective in ways that can include rural-urban migrants.

Further avenues for research may include using price data, or a proxy for them, that are comparable between rural and urban areas, to estimate the real urban wage premium; examining the rural-urban migration process and the rural-urban linkages, including providing a better picture of resource transfers between migrants who travel from rural to urban areas; examining more in depth the learning gains of rural-urban migrants who return to rural

villages; examining whether, as in Bryan et al. (2014), paying a small stipend to urban migrants would induce economically beneficial migration by removing financial barriers to the migration of high ability individuals who would benefit from urbanisation; further analysis of the way in which urban economic benefits spread to rural areas; using a panel dataset across EICV 3, 4 and 5 to use individual fixed effects to eliminate unobservable characteristics and examine the urban wage premium for the same individuals who move from rural to urban areas, and thereby disentangle "selection" effects from "sorting" effects on the urban wage premium.

A Tables

Table 7: City Size and Wages

	EICV 3		EICV 4		EICV 5	
	(1) Ln_Max_Wage_PD_trim	(2) Ln_Max_Wage_PD_trim	(3) Ln_Max_Wage_PD_trim	(4) Ln_Max_Wage_PD_trim	(5) Ln_Max_Wage_PD_trim	(6) Ln_Max_Wage_PD_trim
Rural	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
Small Cities	0.0280	0.0575	0.143*	0.130	0.198***	0.172***
	(0.0783)	(0.0713)	(0.0776)	(0.0816)	(0.0606)	(0.0594)
Mid Sized Cities	0.0882	0.0691	0.234***	0.208***	0.196***	0.167***
	(0.0681)	(0.0669)	(0.0439)	(0.0419)	(0.0464)	(0.0482)
Large Cities (Kigali)	-0.0496	0.306***	0.189**	0.491***	0.136**	0.520***
	(0.0929)	(0.0510)	(0.0747)	(0.0391)	(0.0641)	(0.0429)
Kigali	0.387***		0.310***		0.388***	
	(0.0860)		(0.0706)		(0.0557)	
Southern	0		0		0	
	(.)		(.)		(.)	
Western	-0.0647		-0.0322		-0.0550*	
	(0.0471)		(0.0286)		(0.0287)	
Northern	0.0588		-0.158***		0.0130	
	(0.0523)		(0.0436)		(0.0295)	
Eastern	0.0574		0.0544		-0.0637**	
	(0.0501)		(0.0337)		(0.0295)	
Migrant	0.0312	0.0516*	-0.00954	0.0240	0.0195	0.0215
	(0.0297)	(0.0293)	(0.0236)	(0.0228)	(0.0200)	(0.0201)
Ln_Hours_1	0.0237	0.0240	0.0165	0.0198	0.0170	0.0271**
	(0.0210)	(0.0212)	(0.0153)	(0.0153)	(0.0134)	(0.0137)
Job_Exp_1	-0.00413**	-0.00419**	-0.00402***	-0.00479***	-0.00396***	-0.00461***
	(0.00204)	(0.00208)	(0.00147)	(0.00150)	(0.00128)	(0.00129)
Read	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
Write	0.00687	0.0176	0.0141	0.0149	0.0623	0.0602
	(0.0516)	(0.0517)	(0.0455)	(0.0465)	(0.0392)	(0.0418)
Written Calculation	0.0454	0.0442	0.0991**	0.0797*	0.0566*	0.0563
	(0.0736)	(0.0746)	(0.0480)	(0.0481)	(0.0343)	(0.0351)
Confident in Computer Use	0.753***	0.759***	0.839***	0.829***	0.852***	0.852***
	(0.0736)	(0.0730)	(0.0432)	(0.0432)	(0.0392)	(0.0390)
Constant	6.221***	6.221***	6.463***	6.443***	6.483***	6.445***
	(0.0985)	(0.0945)	(0.0755)	(0.0751)	(0.0686)	(0.0678)
N	3978	3978	7492	7492	8093	8093
r2	0.461	0.457	0.424	0.416	0.503	0.495

	EICV 3		EICV 4		EICV 5	
	(1) Ln_CONS1_AE_trim	(2) Ln_CONS1_AE_trim	(3) Ln_CONS1_AE_trim	(4) Ln_CONS1_AE_trim	(5) Ln_CONS1_AE_trim	(6) Ln_CONS1_AE_trim
Rural	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
Small Cities	0.647***	0.719***	0.469***	0.440***	0.441***	0.399***
	(0.0988)	(0.0971)	(0.0643)	(0.0610)	(0.0695)	(0.0718)
Mid Sized Cities	0.395***	0.348***	0.679***	0.616***	0.416***	0.374***
	(0.0912)	(0.0945)	(0.0651)	(0.0663)	(0.0671)	(0.0665)
Large Cities (Kigali)	0.627***	0.988***	0.570***	1.095***	0.461***	0.890***
	(0.195)	(0.0795)	(0.0791)	(0.0498)	(0.0625)	(0.0481)
Kigali	0.485***		0.613***		0.438***	
	(0.185)		(0.0692)		(0.0509)	
Southern	0		0		0	
	(.)		(.)		(.)	
Western	0.0543		-0.0607		-0.0973***	
	(0.0485)		(0.0374)		(0.0322)	
Northern	0.149		0.0479		-0.0992***	
	(0.0961)		(0.0376)		(0.0326)	
Eastern	0.184***		0.129***		0.00102	
	(0.0534)		(0.0373)		(0.0357)	
Migrant	0.177***	0.207***	0.149***	0.194***	0.164***	0.200***
	(0.0305)	(0.0299)	(0.0203)	(0.0210)	(0.0226)	(0.0215)
Ln_Hours_1	0.257***	0.259***	0.221***	0.229***	0.177***	0.188***
	(0.0326)	(0.0338)	(0.0125)	(0.0129)	(0.0117)	(0.0122)
Job_Exp_1	-0.00626***	-0.00594***	-0.00633***	-0.00703***	-0.00679***	-0.00730***
	(0.00167)	(0.00164)	(0.00133)	(0.00138)	(0.00129)	(0.00129)
Read	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
Write	0.0765	0.0893*	0.0346	0.0395	0.102**	0.0996**
	(0.0490)	(0.0498)	(0.0503)	(0.0517)	(0.0428)	(0.0403)
Written Calculation	-0.0141	-0.00199	0.136***	0.119**	0.0325	0.0444
	(0.0688)	(0.0677)	(0.0521)	(0.0522)	(0.0352)	(0.0347)
Confident in Computer Use	0.459***	0.472***	0.620***	0.609***	0.539***	0.536***
	(0.0763)	(0.0783)	(0.0415)	(0.0417)	(0.0303)	(0.0303)
Constant	11.07***	11.14***	11.20***	11.23***	11.59***	11.50***
	(0.141)	(0.133)	(0.0766)	(0.0729)	(0.0606)	(0.0594)
N	3978	3978	7492	7492	8093	8093
r2	0.545	0.539	0.569	0.555	0.570	0.559

	(1) Ln_CONS1_AE_trim	(2) Ln_Max_Wage_PD_trim	(3) ln_EXP18	(4) Ln_Total_Transfer_In	(5) net_transfer, Winsorized fraction .01	(6) Confident in Computer Use	(7) Written Calculation
Rural Stayer	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Urban Stayer	0.555***	0.386***	0.118*	0.293***	25781.2***	0.0655***	0.0478***
	(0.0365)	(0.0384)	(0.0684)	(0.0743)	(4103.6)	(0.00876)	(0.0111)
Urban Mig. (0-2y)	1.474***	0.00613	0.702***	1.007***	52559.7***	0.00496	0.0957***
	(0.0409)	(0.0320)	(0.0719)	(0.0732)	(7195.6)	(0.00951)	(0.0108)
Urban Mig. (3-4y)	0.990***	0.515***	0.433***	0.670***	46680.5***	0.0598***	0.0261
	(0.0741)	(0.0607)	(0.116)	(0.128)	(14879.9)	(0.0188)	(0.0456)
Urban Mig. (5-6y)	0.926***	0.676***	0.256	0.443**	41425.8**	0.109***	0.105***
	(0.0897)	(0.0513)	(0.170)	(0.189)	(17927.1)	(0.0237)	(0.0168)
Urban Mig. (7-8y)	0.874***	0.764***	0.188	0.335**	19534.9	0.100***	0.0828***
	(0.0628)	(0.0702)	(0.120)	(0.145)	(11981.8)	(0.0225)	(0.0214)
Urban Mig. (9-10y)	0.897***	0.562***	0.259	0.476***	23876.7	0.0793***	0.0105
	(0.0817)	(0.0761)	(0.160)	(0.174)	(15904.6)	(0.0305)	(0.0261)
Urban Mig. (+10y)	0.795***	0.668***	0.455***	0.703***	44462.7***	0.0965***	0.0669***
	(0.0351)	(0.0336)	(0.0690)	(0.0742)	(6068.1)	(0.0121)	(0.0123)
Return Mig.	0.247***	0.252***	0.0272	0.163***	9836.9***	0.0298***	0.0391***
	(0.0191)	(0.0210)	(0.0322)	(0.0342)	(1968.5)	(0.00569)	(0.00746)
Female=1	-0.144***	-0.414***	0.0104	-0.00682	2816.1**	-0.0143***	-0.0352***
	(0.00850)	(0.00988)	(0.0168)	(0.0181)	(1343.6)	(0.00269)	(0.00482)
Sec or Univ edu=0	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Sec or Univ edu=0=1	0.648***	0.670***	0.443***	0.580***	25467.4***	0.442***	0.185***
	(0.0211)	(0.0192)	(0.0304)	(0.0326)	(2979.3)	(0.0104)	(0.00477)
EICV=4	0.0600***	0.217***	-0.142***	-0.125***	34618.2***	-0.0122***	0.00194
	(0.0223)	(0.0202)	(0.0332)	(0.0353)	(2088.8)	(0.00374)	(0.00733)
EICV=5	0.249***	0.314***	0.0369	0.0437	36184.8***	-0.0201***	-0.0236***
	(0.0215)	(0.0186)	(0.0328)	(0.0336)	(1968.6)	(0.00366)	(0.00771)
Constant	11.92***	6.359***	9.562***	9.666***	-10326.7***	-0.0238***	0.832***
	(0.0204)	(0.0189)	(0.0350)	(0.0356)	(2156.4)	(0.00431)	(0.00869)
N	27923	27923	26406	26826	26975	27290	26002
r2	0.396	0.309	0.0440	0.0791	0.0865	0.399	0.0539

References

Ahlfeldt, G. M. and Pietrostefani, E. (2019). The economic effects of density: A synthesis. *Journal of Urban Economics*, 111:93–107.

Alesina, A., Hohmann, S., Michalopoulos, S., and Papaioannou, E. (2019). Intergenerational Mobility in Africa. Technical report, National Bureau of Economic Research.

Angrist, J. D. and Pischke, J.-S. (2008). *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press.

Bower, J. and Murray, S. (2019). Housing need in Kigali. International Growth Centre, Kigali.

Bryan, G., Chowdhury, S., and Mobarak, A. M. (2014). Underinvestment in a profitable technology: The case of seasonal migration in Bangladesh. *Econometrica*, 82(5):1671–1748.

Bryan, G., Glaeser, E., and Tsivanidis, N. (2019). Cities in the developing world. Technical report, National Bureau of Economic Research.

Bundervoet, T., Parby, J. I., Nakamura, S., and Choi, N. (2017). Reshaping urbanization in Rwanda: economic and spatial trends and proposals-note 2: internal migration in Rwanda. Technical report, The World Bank.

Cali, M. and Menon, C. (2013). Does urbanization affect rural poverty? Evidence from Indian districts. *The World Bank Economic Review*, 27(2):171–201.

Chauvin, J. P., Glaeser, E., Ma, Y., and Tobio, K. (2017). What is different about urbanization in rich and poor countries? Cities in Brazil, China, India and the United States. *Journal of Urban Economics*, 98:17–49.

Ciccone, A. and Hall, R. (1996). Productivity and the density of economic activity. *American Economic Review*, 86:5470.

Combes, P.-P., Duranton, G., and Gobillon, L. (2008). Spatial wage disparities: Sorting matters! *Journal of Urban Economics*, 63(2):723–742.

De la Roca, J. and Puga, D. (2017). Learning by working in big cities. *The Review of Economic Studies*, 84(1):106–142.

de Oliveira Cruz, B. and Naticchioni, P. (2012). Falling urban wage premium and inequality trends: evidence for Brazil. *Investigaciones Regionales-Journal of Regional Research*, (24):91–113.

Duranton, G. (2016). Agglomeration effects in Colombia. *Journal of Regional Science*, 56(2):210–238.

Duranton, G. and Puga, D. (2004). Micro-foundations of urban agglomeration economies. In *Handbook of Regional and Urban economics*, volume 4, pages 2063–2117. Elsevier.

Ferré, C., Ferreira, F. H., and Lanjouw, P. (2010). *Is there a metropolitan bias? The inverse relationship between poverty and city size in selected developing countries.*

Glaeser, E. L. and Gottlieb, J. D. (2008). The economics of place-making policies. Technical report, National Bureau of Economic Research.

Glaeser, E. L. and Mare, D. C. (2001). Cities and skills. *Journal of Labor Economics*, 19(2):316–342.

Glaeser, E. L., Resseger, M., and Tobio, K. (2009). Inequality in cities. *Journal of Regional Science*, 49(4):617–646.

Government of Rwanda and World Bank (2020). Future Drivers of Growth in Rwanda: Innovation, Integration, Agglomeration, and Competition.

Henderson, J. V. and Kriticos, S. (2018). The development of the African system of cities. *Annual Review of Economics*, 10:287–314.

Hicks, J. H., Kleemans, M., Li, N. Y., and Miguel, E. (2017). Reevaluating agricultural productivity gaps with longitudinal microdata. Technical report, National Bureau of Economic Research.

Hnatkovska, V. and Lahiri, A. (2012). The rural-urban divide in India.

Johnson, D. G. (1953). Comparability of labor capacities of farm and nonfarm labor. *The American Economic Review*, 43(3):296–313.

Jones, P., D'Aoust, O., and Bernard, L. (2017). The urban wage premium in Africa. In *Wage Inequality in Africa*, pages 33–53. Springer.

Matano, A. and Naticchioni, P. (2016). What drives the urban wage premium? Evidence along the wage distribution. *Journal of Regional Science*, 56(2):191–209.

Meyer, B. D. and Sullivan, J. X. (2003). Measuring the well-being of the poor using income and consumption. Technical report, National Bureau of Economic Research.

NISR (2018). EICV 5 - Main Indicators Report 2016/17. Technical report, NISR.

Page, J., Gutman, J., Madden, P., and Gandhi, D. (2020). Urban economic growth in africa: A framework for analyzing constraints to agglomeration.

Perlman, J. E. (2010). *Parsing the urban poverty puzzle: A multi-generational panel study in Rio de Janeiro's favelas, 1968-2008*. Number 2010/27.

Rajashekar, A. and Bower, J. (2020). Densification without contagion? Overcrowding and pandemic hotspots in Rwanda. International Growth Centre, Kigali.

Rajashekar, A., Richard, M., and Stoelinga, D. (2019). Economic Geography of Rwanda. *Laterite study, International Growth Centre, Kigali. Retrieved from https://www. theigc. org/project/economic-geography-of-rwanda*.

World Bank (2020). Bolstering poverty reduction in Rwanda: a poverty assessment.

The International Growth Centre (IGC) aims to promote sustainable growth in developing countries by providing demand-led policy advice based on frontier research.

Find out more about
our work on our website
www.theigc.org

For media or communications
enquiries, please contact
mail@theigc.org

Subscribe to our newsletter and
topic updates
www.theigc.org/newsletter -signup

Follow us on Twitter
@the_igc

Contact us
International Growth Centre,
London School of Economic
and Political Science, Houghton
Street, London WC2A 2AE

IGC
International
Growth Centre

DIRECTED BY
LSE
UNIVERSITY OF OXFORD

FUNDED BY
UKaid
from the British people

Designed by soapbox.co.uk