Media Exposure and Internal Migration - Evidence from Indonesia*

Lídia Farré
IAE-CSIC, IZA and Barcelona GSE

Francesco Fasani
IAE-CSIC, Barcelona GSE, INSIDE-MOVE and CReAM

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Abstract

This paper investigates the impact of television on internal migration in Indonesia. We exploit the differential introduction of private television throughout the country and the variation in signal reception due to topography to estimate the causal effect of media exposure. Our estimates reveal important long and short run effects. An increase of one standard deviation in the number of private TV channels received in the area of residence as an adolescent reduces future inter-provincial migration by 1.7-2.7 percentage points, and all migration (inter and intra-provincial) by 3.9-6.8 percentage points. Short run effects are similar in magnitude. We also show that respondents less exposed to private television are more likely to consider themselves among the poorest groups in society. As we discuss in a stylized model of migration choice under imperfect information, these findings are consistent with Indonesian citizens over-estimating the net gains from internal migration when access to television is limited.

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1 Introduction

The decision to migrate involves the comparison of the benefits and costs associated with the move. To estimate the expected returns of moving to alternative destinations, potential migrants gather information from different sources. The role played by relatives and friends, previous migrants and networks abroad has been widely analyzed by economists (Winters et al. 2001; Munshi 2003; Hanson and McIntosh 2010; McKenzie and Rapoport 2007 and 2010). Networks are crucial to migration decisions as they provide information on the migration process, facilitate access to the job market and help to smooth integration upon arrival. Therefore, networks are a source of information, but they may also directly reduce migration costs and influence employment outcomes at destination. Disentangling their pure information effect is far from straightforward (Carrington et al. 1996).

In order to isolate the role of information on migration decisions, we focus on an alternative popular source of information: exposure to television. Media have been shown to influence a wide array of individual attitudes and behaviors.[1] In the context of migration, media can be a valuable source of information about potential destinations. The existing evidence suggests important inaccuracies in immigrants' expectations about labor market prospects abroad (McKenzie et al. 2007).[2] Limited or inaccurate information can lead individuals to make sub-optimal migration choices, with important negative welfare consequences. This has considerable implications for policy-makers.

In standard migration decision models, individuals optimally choose to migrate if the expected gains from doing so - net of monetary and non-monetary costs - exceed the expected gains from staying in the original location (Sjaastad 1962). However, net gains from migrat-

[1] Among the outcomes analyzed: political preferences (Della Vigna and Kaplan 2007; Gerber et al. 2009; Enikolopov et al. 2011), attitudes towards different ethnic groups (Gentzkow and Shapiro 2004; Facchini et al. 2009; Della Vigna et al. 2001), social capital (Olken 2009), fertility decisions (La Ferrara et al. 2007) and women's economic and social status (Jensen and Oster 2009).

[2] Migration is not the only area where incomplete information may lead to sub-optimal individual decisions. A related literature has recently revealed the existence of significant gaps between perceived and actual returns to educational choices in developing countries (Attanasio and Kaufmann, 2009; Jensen, 2010).

ing are subject to a substantial amount of uncertainty. In their seminal paper, Harris and Todaro (1970) already took into account the effect of uncertainty by incorporating a positive probability of remaining unemployed in the destination labor market. In their paper, however, agents still have perfect information on the expected gains from migrating. The theoretical literature has investigated different aspects of the relationship between information and migration. For example, Katz and Stark (1987), analyze the effect on migration patterns when immigrant workers are more informed about their skills than native employers.[3] Other authors have modeled the process of gathering information during the job search process in destination labor markets (Herzog et al. 1985; Vishwanath 1991; Daneshvary et al. 1992). There are few papers that look into how information - or the lack of it - influences moving decisions. Pessino (1991) proposes a migration model across geographically separated markets with uncertainty and imperfect information at destination, where agents learn by migrating. Alternatively, Borjas and Bratsberg (1996) show that return migration may result from erroneous information about labor market opportunities abroad. On the empirical side, some authors have studied the nature and source of information available to potential migrants (Banerjee 1984), and their expectations about labor market prospects at destination (McKenzie et al. 2007). There are just a few recent paper that investigate the impact of access to media on migration. Aker et al. (2011) finds that mobile phone technology in Niger has a positive effect on seasonal migration by increasing information about the labor market at destination. Braga (2007) shows that the likelihood of migrating to Italy of Albanian citizens increases with the reception of Italian TV in their regions of origin.

We study the effect of private television on internal migration in Indonesia. This is an interesting case study given the characteristics of the TV liberalization process that began there in the late 1980s. The process dramatically expanded the supply of TV broadcasting - from one single government-owned television station to as many as eleven national channels -

[3]Different aspects of this information asymmetry are investigated by the same authors (Katz and Stark 1986; Stark 1995).

and increased the quality and quantity of information accessible to citizens. The differential introduction of private television throughout the country, together with the variation in signal reception due to topography provide an exogenous source of variation to investigate the causal effect of media exposure on individual migration decisions.[4]

The question we address is whether more (better) informed individuals migrate more or less. We argue in our theoretical model that the answer depends on the type of mistakes made in assessing the net gains from migration. If potential migrants over-estimate (under-estimate) their employment and life prospects in the destination region, wider access to information may decrease (increase) migration pressures. Our empirical results show a negative effect of television exposure on the propensity to internally migrate. In particular, individuals who, during their early teens, lived in areas with less television exposure are more likely to move to a different region later in life than individuals who lived in areas with better reception. Similarly, we find evidence of a negative short term effect of media exposure on migration decisions. Moreover, our estimates also indicate that individuals less exposed to television are systematically more likely to consider themselves among the poorest groups in the country. We address possible concerns of endogeneity of local television exposure by an instrumental variable strategy based on geographical accidents, and carefully test the robustness of our results. We argue that wider access to media increases people's information and allows them to make more accurate choices. Accordingly, the observed reduction in internal movements suggests that in the absence of information, Indonesian citizens were over-estimating the net gains from internal migration.

An alternative interpretation of our results is that broader access to television directly reduced incentives to migrate by making life more pleasant. Nevertheless, we find no significant effect of TV exposure on life satisfaction, suggesting that increased information is driving our results.

[4]The expansion of private television broadcasting in Indonesia was accompanied by a contemporaneous growth of private radio networks. As there are no detailed data on radio reception, we limit our analysis to the impact of television. Olken (2009) shows that TV and radio signals are highly positively correlated. Throughout the paper, we exclusively refer to television exposure, but radio may also be playing a role.

In the following section we briefly describe the characteristics of the television market in Indonesia and its migration history. Section 3 sketches a stylized migration model that incorporates the role of information in the migration decision. Section 4 discusses our identification strategy, and section 5 reports some descriptive evidence. Estimation results are presented in section 6 and 7. Finally, the last section provides some concluding remarks.

2 Television and Internal Migration in Indonesia

2.1 Television

The liberalization of the television market that took place in Indonesia during the 1990s provides an extremely interesting setting for exploring the impact of media exposure on migration behavior. Media liberalization typically has an important impact on the amount and content of information transmitted, especially so in the context of weak democracies or dictatorial regime where TV broadcasting is monopolized by the government (Leeson 2008; Egorov et al. 2009; Gehlbach and Sonin 2011).

In the last decades, the evolution of the media market in Indonesia was deeply linked to - and often determined by - the political events which repeatedly changed the country's system of government and its degree of democracy.[5] Until 1989, there was only one government-owned television station: TVRI, Televisi Republik Indonesia. Founded in 1962, it only started to broadcast throughout the entire archipelago in 1976, after the launch of the first Indonesian communication satellite. TVRI was under the direct control of president Suharto and its

[5] In 1950, one year after the recognition of independence from the Netherlands, Indonesia adopted a parliamentary democracy system which lasted until 1957. President Sukarno - the leader of the Indonesian independence struggle - proclaimed martial law and established a presidential system (in 1959). The parliamentary democracy was turned into a "guided democracy" (*Demokrasi Terpimpin*), a system which progressively became more and more autocratic. In 1965, general Suharto seized power: he was appointed president and replaced Sukarno's "guided democracy" with his version of a dictatorial regime, the "New Order" (*Orde Baru*). The Asian financial crisis of 1997 - which dramatically hit the Indonesian economy - triggered a violent outburst of the lasting demand for democratic reform. Suharto's rule finally ended in 1998 when he was forced to resign by student protests and riots across the country. Indonesia then entered a constitutional reform process that defined its current system of government - a presidential republic - based upon a balance of powers. The first democratic elections were held in 2004.

programs were expected to contribute to the image of unity of the nation by supporting government's development policies and by promoting national cohesion, law and order (Kitley 2000). Throughout the years of Suharto's government, censorship severely limited freedom of information. The so-called "SARA doctrine" was imposed, prohibiting any mentioning of sensitive issues such as ethnicity, religion, race, and social class (*Suku, Agama, Ras, Antargolongan*). Negative reporting was also actively discouraged (d'Haenens et al. 1999). Formal Indonesian was the principal language of broadcast, while regional languages were restricted to particular programs. In these years, TVRI monopolized information and perpetuated the government's interests (Kitley 2001).

The first step towards a partial liberalization of the media market took place in 1986 when the government adopted the Open Sky policy, allowing private television distribution through satellite dishes and cable networks. Five private networks were created: RCTI (1987), SCTV (1989), TPI (1990), ANTV (1993), and Indosiar (1995). During these first few years, commercial television was only available to those who could afford the service, but in 1993 the government liberalized the television market, allowing commercial channels to offer free-to-air services that progressively covered the whole country (Kukuh 2002; Olken 2009). This first phase of deregulation was far from complete: the licensing process was not transparent (as licenses were basically issued to Suharto's relatives or cronies), the government maintained formal (and informal) control on programs content and private news production was prohibited (Hollander et al. 2009).

During the 1990s there were increasing pressure for democratic reforms, including a strong demand for more information and especially independent news. Private TV channels found themselves in the difficult position of finding a balance between pleasing the government's censorship and providing enough TV news to win audience shares in an increasingly competitive environment. To circumvent the prohibition on news production, commercial stations broadcast news under the guise of so-called "information programs"; these provided a more in-depth and analytical approach with particular emphasis on local events and using local languages (Sen and

Hill 2000). The 1996 Broadcasting Act officially authorized private TV stations to broadcast their own news programmes. This decision formally broke the government monopoly in the production of TV news, although several constraints were still maintained.[6]

The public TVRI network ignored the escalation of protests against the government in 1998, but commercial stations started providing full coverage (Sen and Hill 2000). After Suharto's resignation (on May 21, 1998), private television stations were legally allowed to produce, program and broadcast their own news. Private broadcasters introduced new formats never used before by TVRI (i.e., news headlines between commercial spots, breaking news or on-the-hour news reports), and began broadcasting from local communities employing dialects. Overall there was a gradual shift towards more sensitive topics (political corruption, ethnic conflicts, poverty, etc.) (Dahlan 1999). Between 2000 and 2002, five newcomers had entered the market. Thus, today there are 11 television stations with a license for nationwide broadcasting over the air: the government-run channel (TVRI), three major networks (RCTI, SCTV, and Indosiar), one all-news station (Metro TV), and six minor networks (ANTV, GLOBALTV, LATIVI, TV7, TransTV and TPI).

According to the World Value Survey (2000 and 2006), television is currently a very important source of information in Indonesia. After the church and the army, television is the most trusted institution in the country: 68 percent of the respondents in 2000 (61 percent in 2006) report to have a great deal or quite a lot of confidence in television. Moreover, 91 percent of the respondents use TV news broadcasts to gather information and 68 percent relies on in-depth reports on radio or TV.

2.2 Internal Migration

The population of Indonesia grew from 119 million in 1971 to 230 million in 2008, and is now the world's fourth most populous country. It is also the world's largest archipelago, consisting

[6]For instance, all channels were still required to broadcast the 7.00 and 9.00 p.m. public TVRI network news and all government messages. Moreover, all the incidents reported had to be more than twenty-four hours old, so that the official reactions were already known (d'Haenes et al. 1999).

of about 17 thousand islands which span more than 5 thousand km. Indonesia is organized in provinces (*provinsi*) which are divided into districts (*kabupaten*) having their own local government and legislative body. In 2000, there were 33 provinces and 502 districts.

There are several reasons to focus the analysis on internal rather than international migration.[7] First, the longitudinal data employed in this paper (Indonesian Family Life Survey) contain detailed information on individuals' migration histories enabling us to track them when they migrate within the country, but not when they move abroad (Duncan et al. 2001). Second, while it is clear that the media liberalization process provided a more accurate picture of the country, it is harder to establish whether the same happened regarding information about foreign countries.[8] Third, the population size and geographical extension of Indonesia makes it a suitable candidate to draw lessons on internal movements for other large countries such as India or China where the issue has increasing policy relevance. Finally, internal migration is an important and long lasting phenomenon in Indonesia, while international movements are still relatively limited.[9]

According to the 1930 census, 11.5 percent of the total native population lived outside their district of birth, although only about half of them (5.6 percent) had moved beyond provincial borders. Starting from the early 1950s, the Indonesian government has also actively encouraged internal migration to the outer islands: these so-called "Transmigration plans" aimed at relieving population pressure in Java and other densely populated areas. About 90 thousand households were relocated from 1950 to 1968. By 1997, approximately 1.4 million families, or 6.5 million people, had been moved (Hardjono 1988; Fearnside 1997; Tirtosudarmo 2009). After the economic crises of 1997, and the subsequent transition to democracy, transmigration programs were practically abandoned. Although the government was implementing these

[7] Although this is not the focus of the paper, in the empirical analysis we also look at international migration.

[8] Having more access to television may make individuals in origin countries more aware of conditions and opportunities in potential destination countries, but it may also convey distorted information - through feature films, TV series or soap operas (Mai 2004).

[9] In 2000, about 10 percent of the population lived in a province different from that of birth (with intra-provincial migration being about two-three times larger), while in 2006 only an estimated 1.5 percent lived abroad (Ducanes and Abella 2009).

"Transmigration plans", internal migration was never restricted in Indonesia. On the contrary, it was constantly increasing - driven by the wage differentials between provinces and the attractiveness of the Jakarta area - generally flowing in the opposite direction with respect to the government migration policies.[10] In 1971, the size of inter-provincial migration was still similar to that of the colonial period (4.9 percent), and then increased to 7 percent in 1980, 8.2 percent in 1990 and 10.1 percent by 2000 (Hill et al. 2008; Tirtosudarmo 2009). In 2000 about 20 million people in Indonesia were living in a province different from that of birth.

3 Theoretical framework

In standard migration decision models, individuals optimally choose to move if the expected gains from doing so - net of monetary and non-monetary costs - exceed the gains from staying in their original location (Sjaastad, 1962). A common assumption in this approach is that individuals have sufficient information to correctly predict these gains and costs. However, potential migrants may have a very imprecise idea of the level of earnings and probability of finding a job in labor markets where they have never been. Moreover, they may fail to accurately account for all the direct and indirect costs associated with their possible moves. Lack of information in migrating decisions implies that although individuals act rationally, they may make sub-optimal decisions. Within this framework, starting from a standard Roy model applied to migration choices (Borjas, 1987), we model access to information (TV exposure, in our case) as a factor that contributes to reduce the gap between expectations about the (net) gains from migration and the real ones.

Suppose individuals originate in source region S and consider the possibility of moving to destination region D.[11] Potential migrants are assumed to be risk neutral. The log earnings

[10] For instance, Fearnside (1997) estimates that transmigration programs during the 1980s at most relieved 17 percent of the population growth in Java.

[11] In our stylized setup, we consider only one potential destination. In the presence of several destinations, incomplete information leads to sub-optimal choices when individuals are not able to correctly rank the different alternatives (including the non-migration option). The implications of our model hold also in this context.

distribution in the source and destination regions are:

$$w_j = \mu_j + \epsilon_j \quad \text{with} \quad j = S, D \tag{1}$$

where μ_j is the mean log earnings and ϵ_j is the individual return (i.e., ability) in region j. An individual migrates ($I = 1$) if earnings at destination are higher than (or equal to) those in the source region, net of a migration cost (π):

$$\mu_D + \epsilon_D - \pi \geq \mu_S + \epsilon_S. \tag{2}$$

This condition can be re-written as: $v \geq \Delta$, where $v = (\epsilon_D - \epsilon_S)$ and $\Delta = (\mu_S - \mu_D + \pi)$. Assuming that $v \sim N(0, \sigma_v^2)$, we have:

$$Pr(I = 1) = Pr(v \geq \Delta) = 1 - \Phi\left(\frac{\Delta}{\sigma_v}\right) \tag{3}$$

where Φ is the standard normal distribution function.

Now, suppose individuals do not know exactly their net earnings at destination. We model this possibility by including an additive error term in the left-hand side of inequality (2). We assume that this error term is constant in the population and equal to q. This term is positive if individuals over-estimate the net gains from migrating and negative if they under-estimate them. When making their moving decisions, individuals ignore both the size and the sign of q. An individual will migrate ($I_q = 1$) if:

$$(\mu_D + \epsilon_D - \pi) + q \geq \mu_S + \epsilon_S \tag{4}$$

Given that $(v + q) \sim N(q, \sigma_v^2)$, we have:

$$Pr(I_q = 1) = Pr(v + q \geq \Delta) = 1 - \Phi\left(\frac{\Delta - q}{\sigma_v}\right). \tag{5}$$

The presence of the error term q shifts the distribution of v to the left or to the right, depending on whether q is negative (under-estimation) or positive (over-estimation). Thus, the probability of migrating will be higher (lower) if q is positive (negative). Indeed:

$$Pr(I_q = 1) \geq Pr(I = 1) \qquad \text{if} \qquad \frac{\Delta - q}{\sigma_v} \leq \frac{\Delta}{\sigma_v} \tag{6}$$

which is always true for $q \geq 0$, and never for $q < 0$. Within this framework, individuals can be classified in four different groups. In the presence of over-estimated gains ($q \geq 0$), there is more migration than otherwise would be optimal: there are individuals for whom migration is always optimal (optimal migrants, OM) and others who would have not migrated had they not over-estimated the gains from doing so (sub-optimal migrants, SM). Those who decide to stay in spite of the over-estimated gain, would have stayed in any case (optimal stayers, OS). When individuals under-estimate migration gains ($q < 0$), instead, all migrants are optimal ones (OM), while among the stayers there are both optimal (OS) and sub-optimal ones (SS). The latter group, indeed, would have migrated in absence of the negative error q (see Appendix A 1.1). These four groups are illustrated in figure 1. The vertical axis corresponds to the measure of individual ability v, while on the horizontal one there is the error in predicting the gains from migration q. The solid line with negative slope is given by $(\Delta - q)$ and it crosses the vertical axis at $v = \Delta$. All individuals with a value of v above (below) this line migrate (stay). Note that when $q = 0$, all migrants are optimal (i.e., all stayers are optimal). For positive values of q, instead, the larger q the larger the number of people migrating: we have an increasing share of sub-optimal migrants (and a decreasing share of optimal stayers). The opposite is true for negative values of q: the more negative q, the less people migrate, and the larger the share of sub-optimal stayers (at the expense of the share of optimal migrants).

Now, suppose the error individuals make in assessing the net gains from migration (q)

negatively depends on the amount of information available:

$$q = \frac{\overline{q}}{i} \tag{7}$$

where $\overline{q}$ is the error made in the absence of information and i is the level of information individuals have access to, with $i \in [1, +\infty)$. If individuals have no information (or only have access to government-owned TV station, as in our case) the information parameter i is equal to one, and q=$\overline{q}$. At the opposite extreme, if they receive full information ($i \to +\infty$), there is no error in their migration decisions ($q = 0$). It is straightforward to show (see Appendix A 1.2) that if the gains were over-estimated ($\overline{q} \geq 0$), more information would reduce the number of sub-optimal migrants (SM), increasing the number of optimal stayers (OS). On the contrary, with under-estimated gains ($\overline{q} < 0$), the number of sub-optimal stayers (SS) would fall, raising the number of optimal migrants (OM). As the total number of migrants is given by the sum of optimal and sub-optimal migrants, more information reduces (increases) the propensity to migrate in the presence of over- (under-) estimated gains from migration.

A key implication of the model is that more information does not lead to unambiguous prediction about the number of migration movements one should observe in the data.[12] This depends on whether individuals are, on average, over- rather than under-estimating the returns from migrating (i.e., being more informed leads to less migration in the first case and more in the second). Therefore, empirically establishing whether wider access to private television increases, rather than decreases, the propensity to migrate allows us to infer the type of error individuals are actually making. We perform this exercise in the empirical part of the paper.

[12] A second important implication is that information increases welfare by reducing the number of sub-optimal choices.

4 Empirical analysis

4.1 Data

For our empirical analysis, we employ two datasets: the Indonesia Family Life Survey (IFLS), which provides individual data and migration histories, and the PODES (The Village Potential Statistics), which has information on TV reception at the village level.

The Indonesia Family Life Survey is an on-going longitudinal survey. Four waves have been conducted so far: 1993 (IFLS1), 1997-1998 (IFLS2), 2000 (IFLS3) and 2007-2008 (IFLS4). The IFLS1 sampling scheme stratified on provinces and urban/rural locations and then randomly sampled within these strata. Provinces were selected to maximize representation of the population and capture the cultural and socioeconomic diversity of Indonesia. The final sample contains over 30,000 individuals living in 13 different provinces, representative of about 83 percent of the Indonesian population. In the first wave, a representative member was selected to provide household level demographic and economic information. In addition, several household members (aged 15 and older) were randomly selected and asked to provide detailed current and retrospective information on their education, employment, fertility, marriage and migration experiences. Subsequent waves re-interviewed the original households (and all the members older than 15) and tracked individuals who had moved to another destination within the country.[13] We employ all the four waves of the IFLS in our analysis.

The information on TV reception comes from the PODES (Village Potential Statistics). This survey provides information about village characteristics for all of Indonesia, and is part of a series of periodic censuses (Agriculture, Economy, Population). The 2006 PODES first introduced detailed questions regarding reception of all the existing 11 Indonesian TV channels.[14]

[13] See Duncan et al.(2001) for a positive assessment of the attempt to track movers in IFLS. Indeed, the survey had very high re-interview rates. In IFLS1, 7,224 households were interviewed and detailed individual-level data were collected from over 22,000 respondents. In each of the following waves, approximately 94 percent of IFLS1 households were re-contacted. Among IFLS1 dynasty households (any part of the original IFLS1 households) 87.6 percent were actually interviewed in all four waves and 3 percent died.

[14] Questions about TV reception were introduced for the first time in the PODES conducted in 2003. However, in that year the questions referred only to the public channel and to four of the private networks (TPI, RCTI,

For each TV channel, the head of the village was asked whether there was sufficient signal in the village as to clearly watch the programs.

4.2 Empirical model

Our empirical exercise begins by taking a long run perspective and analyzes the effect of TV exposure as an adolescent on the future migration behavior of Indonesian citizens. Throughout the paper, we refer to this part of the analysis as *"early exposure"*. Given that most of the migration movements occur at a young age, they may be substantially influenced by expectations formed early in life. Having more or less access to television is likely to shape individuals' views on their country, area of residence and relative position in society: these are all elements which will combine to determine future migration decisions. However, migration choices are not just the deterministic outcome of beliefs formed at a young age. Individuals may update their expectations when new information becomes available, and re-optimize their decisions. Hence, in the second part of our empirical analysis we focus on these short run effects, and estimate the contemporaneous relationship between TV exposure and migrating decisions. We refer to this part of the analysis as *"current exposure"*.

In both the short and long run analysis, we estimate the following empirical model:

$$mig_{ikp}^{J} = \alpha^{J} + \beta^{J} TV_{kp}^{J} + \mathbf{X}_{ikp}\gamma^{J} + \mathbf{Y}_{kp}^{J}\eta^{J} + \delta_{p}^{J} + u_{ikp}^{J} \quad \text{with} \quad J = E, C \tag{8}$$

where the superscript J defines the timing of the analysis ($J = E$ for *early exposure* and $J = C$ for *current exposure*). The dependent variable mig_{ikp}^{J} is a migration outcome for individual i, who lives in district k and province p, at the time J when TV exposure is measured. The main explanatory variable in equation (8) is TV_{kp}^{J} which captures TV exposure measured at time J, in district k and province p. The empirical model includes also a constant α^{J}, a vector of individual-level controls $\mathbf{X}_{ikp}$, a vector of district-level controls $\mathbf{Y}_{kp}^{J}$, province fixed effects δ_{p}^{J}

SCTV and Indosiar).

and an unobserved error term u^J_{ikp}.

The main difference in the empirical specification for the *early* and the *current exposure* analysis concerns the construction of the dependent variable (i.e., the migration outcome) and the main explanatory variable (i.e., the measure of TV exposure). In the *early exposure*, we focus on all individuals interviewed in the last wave of the IFLS4 (2007-2008) and define the migration outcome (mig^E_{ikp}) as an indicator variable that takes value 1 if the current residence of the respondents - or any of the residences recorded in the three previous waves of the survey - differs from that at age 12, and 0 otherwise.[15] We define two different migration outcomes: The first includes both inter and intra-provincial migration and the second considers only inter-provincial movements. To be consistent with the provincial stratification scheme in the IFLS, we restrict the analysis to individuals who at age 12 resided in any of the 13 provinces included in the first wave of the survey (IFLS1). There are $18,598$ individuals with valid information to conduct the *early exposure* analysis, reduced to $14,648$ with our sample restricted to those aged 45 or younger, as we do in most of the analysis.

The main explanatory variable in the *early exposure* analysis (TV^E_{kp}) is measured as the predicted degree of TV reception in the district where the respondent lived as an adolescent. Information on TV reception is only available from the 2006 PODES, and there are no available records on how reception evolved over time in different areas.[16] Therefore, we need to make some assumptions to reconstruct the development of TV reception over time and across areas. We know the year each private station was founded and began broadcasting at the national level (see Table 1). From the PODES we can measure the share of villages in each district with clear reception of each private channel in 2006. To construct our measure of *early exposure*, for each district and channel, we set reception equal to zero prior to the year when the channel started broadcasting. We then assume reception increased linearly from zero up to the level seized in

[15]Individuals in the IFLS are only interviewed when they are older than 15. Thus information on the residence at age 12 is always retrospective.

[16]In both the *early* and *current exposure*, we follow Olken (2009) and exclude from the analysis major cities such as Jakarta, Surabaya and Medan, where private television broadcasting started well before the rest of the country.

2006 by the PODES.[17] In this way, we obtain a yearly prediction of the share of villages in the district with reception of each channel. Next, for each year and district, we sum it across channels and obtain the predicted number of channels received, by district and year. Finally, to compute TV exposure as an adolescent we match each individual with the predicted number of channels received in the district of residence at age 12, and average it over the six years when the individual was aged 10-16.[18] Therefore, our measure of TV exposure varies by district and cohort of birth. In particular, individuals who were aged 10-16 before the first private network was created (1987) had zero exposure to private television, while younger cohorts will have a higher level of *early exposure* than older cohorts from the same district of origin. This allows us to exploit not only the cross-sectional variation in signal reception due to geography, but also the time variation due to the natural experiment related to the TV liberalization process.

To investigate the short term effects of TV exposure we conduct the *current exposure* analysis. We focus on the sample of individuals interviewed both in 2000 (IFLS3) and $2007-2008$ (IFLS4) who report valid information on all migration movements (if any) over this period. In this case, the dependent variable, (mig^C_{ikp}), takes value 1 if the respondent changed district and/or province of residence between the two waves (and stayed in the new residence for at least six months), and 0 otherwise. As in the *early exposure*, we analyze migration both at the inter and intra-provincial margin. We have $8,345$ individuals aged 45 or less. To measure their TV reception we assume the number of channels received in each district in 2006 is unchanged from 2000, and obtain the level of current TV reception (TV^C_{kp}) by averaging the number of channels received by the villages in each district.

[17] We have experimented with different specifications for the functional form employed to predict reception (i.e., exponential functional forms) and our results remain substantially unaffected.

[18] Using different age ranges to define adolescents in our *early exposure* measure of TV reception does not significantly change our results.

4.3 Identification strategy

The main parameter of interest in our analysis is the coefficient β^J in equation (8), which measures the causal impact of TV exposure on individual propensity to migrate in the long run (β^E) and short run (β^C). Since we lack experimental data, where individuals are randomly exposed to different levels of TV reception, we need to carefully discuss under which conditions these parameters can be identified.

The first general concern is the endogeneity of individual choices in using media. Given the existing set of possibilities to access media, individuals choose whether to use them and, if so, which particular media and to which extent. Thus, a significant relationship between media usage and some individual outcome may simply result from some unobserved heterogeneity determining both variables. More entrepreneurial individuals, for instance, may use media more intensively and at the same time be more likely to migrate. Moreover, access to media may simply be a proxy for some individual/household observable characteristic not fully captured in survey data. For example, wealthier households may be more likely to own a TV set and less likely to migrate. To overcome these concerns, we measure media exposure using TV reception in the area where the interviewees live, rather than as the actual individual TV ownership or time spent watching TV.[19]

However, an obvious concern is that TV reception in the region is not necessarily exogenous. There may well be unobserved factors that simultaneously affect TV reception and migration patterns in the area. For example, affluent areas may be more successful in attracting private TV broadcasters and, at the same time, present lower out-migration rates. This will lead to a downward bias estimate of β. It is also possible that more remote areas have weaker TV signal and as well have lower migration rates due to the higher costs of moving away. In this case,

[19]The IFLS contains information on TV ownership in the last three waves. The share of respondents living in households with a TV has increased from 62% in 1997 to 82% in 2007-2008. The IFLS, instead, does not collect information on time spent watching TV. Olken (2009) shows that each additional private TV channel received is associated with about 8% increase in time spent in front of the TV, while it has no effect on TV ownership. The latter result is not surprising in a society such as Indonesia, where the share of TV owners is very high and almost everyone has access to television (in Olkens data, 97% of households watch TV).

the OLS estimate of β will present a positive bias. On the other hand, insofar as the variation in the number of channels across different areas purely responds to topographic accidents (i.e., mountains, valleys or flats) that have no direct impact on migration patterns, the OLS estimate of β will be unbiased.

In the empirical analysis, we combine three different strategies to investigate the potential endogeneity of TV reception and estimate its causal effect. First, we include province fixed effects δ_p^J in all regressions to capture any time-invariant characteristics at the provincial level.[20] Second, we add to the empirical model a set of control variables at the district level, $\mathbf{Y}_{kp}^J$, to capture geographical, economic and demographic characteristics. Finally, we apply an instrumental variable strategy based on the Indonesia's mountainous terrain, developed by Olken (2009).[21] This strategy exploits the differences across districts in television reception due to the topography (i.e., mountains and curvature of earth) between the districts' reception points and the location of television transmitters. Indeed, the strength of TV signal negatively depends on (a) the distance between the TV transmitter and the reception area, and (b) the presence and altitude of mountains between the two points. Olken (2009) uses a physical model of electromagnetic signal propagation to estimate a measure of "predicted signal strength" ($TV - PSS$) in each district, which captures the effect on TV reception of both topography and distance. Then, in order to isolate the pure effect of topography, Olken (2009) estimates the "free-space signal strength" ($TV - FSS$), which is the strength that would have been obtained were there a direct line of sight between the transmitter and the receiver.[22] Including this latter variable ($TV - FSS$) as an additional control for the effect of distance in equation 8, and using the "predicted signal strength" ($TV - PSS$) as an instrument for the actual TV exposure, allows us to isolate the variation in signal strength that is exclusively due to topographical idiosyncrasies

[20] TV exposure has only variation at the district level in the *current exposure* analysis, and variation at the district-cohort level in the *early exposure* analysis. Thus district fixed effects can not be separately identified from TV exposure (and year of birth dummies).

[21] A similar identification strategy, based on predicted signal, is used in Enikolopov et al. (2011).

[22] Note that Olken (2009) defines the $TV - PSS$ and $TV - FSS$ variable as the maximum signal strength between all transmitters and receiver points at the subdistrict level. Since we conduct the analysis at the district level, these variables are defined as district averages.

and the curvature of earth. The exclusion restriction for this instrumental variable strategy holds under the reasonable assumption that, once other district-level geographical variables (distance from the nearest city, distance from the nearest TV transmitter, altitude, etc.) are controlled for, topographical idiosyncrasies *per se* have no direct effect on migration decisions. We borrow these two constructed measures of TV signal strength from Olken (2009).

5 Descriptive evidence

Table 2 reports descriptive statistics for the sample employed in the analysis. The upper part refers to the long term analysis (*early exposure*). There are 14,648 individuals aged 16-45; 48 percent are male, and the average age is 29; 34 percent of them have received only a primary education, 55 percent a secondary education and 10 percent went to college. About 14 percent of the sample resided in an urban area at age 12. There are about 4.5 thousand internal migrants (respondents who moved inter or intra-provincially) in this sample. While the share of males is substantially identical, migrants are slightly older and more educated than non-migrants, and slightly less likely to have lived in urban areas at age 12. The lower part of table 2 reports the descriptives for the short term analysis (*current exposure*). There are 8,345 individuals aged 45 or younger, and their average characteristics strongly resemble those in the previous sample. Approximately a thousand of them are identified as migrants.

Table 3 shows the distribution of respondents across provinces according to the residence at age 12 for the *early exposure* analysis or according to the residence in 2000 for the *current exposure*. The bulk of our sample resides in the three provinces of Jawa Barat, Jawa Tengah and Jawa Timur, each of which hosts 16-20 percent of the respondents. About 7-10 percent of the interviewees reside in either of two provinces, Bali and Nusa Tenggara Barat. Our focus is on geographical movements across provinces (i.e., inter-provincial migration) or across districts within the same province (i.e., intra-provincial migration). Table 4 reports descriptive evidence on internal migration rates. About 30 percent of the individuals in the *early exposure* sample

have migrated inter or intra-provincially with respect to the district of residence at age 12, with the subset which migrated to another province being equal to 11 percent. Although the levels are lower due to the shorter time span considered, the *current exposure* sample shows an analogous pattern: about 12 percent of the sample migrated inter or intra-provincially, and 5.5 percent changed province of residence between 2000 and $2007-2008$. In developing countries, internal movements generally are thought to occur mainly from rural to urban areas. However, table 5 shows that the majority of people in our sample move across rural areas (42 percent in the *early exposure* sample and 51 percent in the *current exposure* one), while a smaller, but still considerable, fraction migrate form rural to urban areas (39 percent in the *early exposure* sample and 30 percent in the *current exposure* one). A sizeable number of respondents move from urban to rural areas (respectively, 12 and 7 percent) and across urban areas (respectively, 7 and 11 percent).

Finally, table 1 presents descriptive statistics of TV reception. For each channel operating in Indonesia in 2006, the table reports the year of establishment (or first year on air). It also shows the average fraction of villages within each district with access to each private TV channel. The last row of the table reports descriptive statistics for the main explanatory variable in the analysis, (TV^J_{kp}). In the *early exposure* sample, the respondents lived in districts receiving on average 1.2 private channels, with some districts having zero reception and others receiving up to 8.4 channels. In the *current exposure* sample, instead, the average number of private channels increases to 6.2, some districts having all ten private channels and others still being without reception.

6 Estimation results

6.1 TV reception and district characteristics

We start the empirical analysis addressing the possibility that TV reception captures some characteristics of the local areas that may also have a direct effect on migration patterns. In doing so, we estimate the following regression:

$$TV_{kp}^{2006} = \mu + \mathbf{X}_{kp}\lambda + \delta_p + \varepsilon_{kp} \tag{9}$$

where the dependent variable TV_{kp}^{2006} is the average number of channels received by the villages in district k and province p according to the 2006 PODES. As explained in section 4.1, this is the source of information on TV reception we use throughout the paper. The estimating equation includes a constant μ, a vector of district controls $\mathbf{X}_{kp}$ (which capture geographical, demographic, social and economic features of the area), province fixed effects δ_p and an idiosyncratic error term ε_{kp}.[23] We run this regression on the 107 districts for which all variables are non-missing.

The OLS estimates of equation (9) are presented in table 6. The only control significantly correlated with TV reception is distance in km from the province capital. The negative coefficient on this variable implies that the number of channels received increases with proximity to the capital.[24] None of the other controls shows a significant correlation with TV reception.

This preliminary analysis leads to two relevant insights. First, TV reception at the district

[23]The included district controls are: distance in *km* and in hours from the province capital; altitude; a coastal district dummy; level of urbanization; number of schools; log of total population; percentage of households living in slums; percentage of households with at least one member that has attended university; percentage of poor households; percentage of villages in the district where the main activity is agriculture, industry or trade; log of monthly average household consumption (thousand of rupiahs); and years since electricity was introduced. All the controls are measured using the IFLS3 collected in 2000, which contains information at the household and/or village level. The controls in equation (9) are averages at the district level.

[24]When separately included in the regression, both the distance in hours and in km are strongly significant and negatively related to TV reception. When both measures are included as regressors, the presence of collinearity leads to an insignificant coefficient on the distance in hours. Throughout the empirical analysis, we maintain both controls in our specifications because the measure in hours may in some cases capture aspects of the distance (such as road quality) which are not controlled for by the measure in km.

level does not seem to capture the level of economic development in the area, which is likely to be an important determinant of migratory flows. Second, proximity to the province capital affects TV reception and is also likely to have a direct effect on migration by reducing moving costs. Therefore, failing to control for geographical remoteness may bias our estimates. In order to avoid that, all the specifications for the individual migration model control for distance from the nearest TV transmitter (usually located in the nearest town or city) by including the "free-space signal strength" variable ($TV - FSS$) described in section 4.3. Moreover, our preferred specifications include a large set of district controls to capture both economic and geographical features on the area.

6.2 Long and short run effects of TV exposure

Early exposure. Our main results for the long run effect of TV exposure are reported in table 7. The table shows the estimation results for alternative specifications of equation (8). The first half of the table (columns 1-6) looks at both inter and intra-provincial migration, while the second half (columns 7-12) focuses only on inter-provincial movements. Standard errors are clustered by district to allow for any possible correlation in the unobservables of individuals who lived in the same district at age 12.

Apart from the measure of TV exposure at the district level where the respondent lived as an adolescent (TV), our baseline specification includes the predicted "free-space signal strength variable" ($TV - FSS$), a dummy for male respondent, and a full set of dummies for year of birth and for the province of residence at age 12. We then add education dummies (primary, secondary, college and other education), and in our preferred specification (columns 3, 6, 9 and 12) include district-level controls to capture differences in geographical, demographic and economic characteristics across areas.[25]

[25]For the *early exposure* analysis, these variables are measured at the beginning of the TV liberalization process, using the first wave of the IFLS in 1993: distance from the province capital (in km); degree of urbanization; number of schools; altitude; share of coastal villages; share of villages where primary activity is agriculture, industry or trade; number of households; share of houses with cement walls; log of monthly household consumption, and years since electricity was introduced. All controls are averaged at the district level.

All specifications reveal strong evidence of early TV exposure playing a significant role in reducing future propensity to migrate. The OLS estimates of inter and intra-provincial migration (columns 1-3) indicate that having been exposed to one additional TV channel as an adolescent reduces the propensity to migrate by about 2.1-2.3 percentage points. Similar results are obtained for the propensity to migrate to a different province (columns 7-9), though the coefficient is about half in size: exposure to one additional TV channel reduces the probability of inter-provincial migration by about 0.9-1.1 percentage points. These results are robust to the gradual reduction in sample size which occurs when we control for education and district characteristics. The inclusion of these latter variables does not alter the estimated coefficient on TV exposure, suggesting our results are not driven by omitted district variables affecting both migration patterns and TV reception.

To address any further concern regarding the presence of endogeneity, we implement the IV strategy discussed in section 4.3. The potentially endogenous TV reception variable is instrumented using the "predicted signal strength" ($TV-PSS$) as constructed by Olken (2009).[26] In all regressions we also include the "predicted free-space signal strength" measure ($TV-FSS$), which controls for the mere effect of distance to the nearest TV transmitter. Once this latter variable is included in the estimation, the instrument captures only the variation in signal reception due to differences in the mountainous terrain between transmitter and receiving points. Table 8 shows first stage estimates of the IV strategy for the *early exposure* analysis (columns 1-3). In all specifications, the instrument is significant at any conventional level. The F-statistic of the excluded instrument oscillates between 221 and 272, well above the conventional threshold of 10 for strong instruments. This rules out any concern about potential biases in the second stage due to the use of weak instruments. Table 7 reports second stage results. In all cases, the estimated IV coefficients on TV exposure are negative, strongly significant and

[26]Since "*early TV exposure*" is zero (or close to zero) for older cohorts (i.e., there was not reception of private TV in their district of residence as adolescents), we interact the instrument $TV-PSS$ with a dummy which is equal to 1 for individuals younger than 12 in 1993. We choose 1993 as it is only in this year when free, over-the-air, broadcasts began in locations other than Jakarta (Olken 2009). Our results are robust to the choice of any year in the neighborhood of 1993.

larger in magnitude than those of the OLS. According to these estimates, the exposure to one additional private TV channel reduces inter-provincial migration by 1.4-1.5 percentage point, and all migration movements by 3.7-4.0 percentage points.

Two important conclusions can be drawn from this set of estimates. First, we find clear evidence that being exposed to more television as an adolescent caused a reduction in the future propensity to migrate towards other areas of the country. Second, we can discuss the extent of endogeneity in our estimations by looking at the difference between OLS and IV estimates. The IV coefficients are about 1.4-1.7 times the OLS and the standard errors increase by about the same factor. In the absence of endogeneity, OLS and IV estimates should differ only by sampling error. To formally test the presence of endogeneity we perform the regression-based version of the Hausman test.[27] The test shows weak evidence of endogeneity, the residuals being significant (and at the 10 percent level) only in one case. Therefore, we cannot clearly reject the hypothesis of exogeneity of TV exposure. This is a consistent finding throughout our analysis, implying that our OLS estimates have a causal interpretation.

The exogeneity of TV exposure is not a particularly surprising finding in our context. First of all, we measure TV exposure by TV reception in the local area, which is less likely to be correlated with individual unobserved characteristics than TV ownership or time spent watching TV. Moreover, once we control for remoteness, the difference in topography between transmitting and receiving locations is what ultimately drives district variation in TV reception. It is then not unreasonable to think that these differences in topography are as good as random.[28]

Current exposure. Let us now turn to analyzing the short term effect of TV exposure. Table 9 reports OLS and IV estimates of the propensity to migrate at the inter and intra-provincial

[27]This test is asymptotically equivalent to the original version of the Hausman test, but it allows easily obtaining a fully robust statistic (Wooldridge, 2002). Accordingly, we include the residuals of the first-stage regression as an additional control in equation (8), and test whether the coefficient on these residuals (i.e., the control function) is statistically significant. The estimated coefficient on the control function, and its associated standard errors, are displayed in the last two rows of table 7.

[28]Our findings regarding the exogeneity of TV exposure are consistent with those in Olken (2009), who finds IV results very similar to the OLS ones.

level (columns 1-6) and at the provincial level only (columns 7-12). The estimating equation and specifications (baseline, with education dummies, and with district controls) are identical to those used to assess the long run effect, and the table follows exactly the same structure as table 7.[29] The OLS estimates of the short run effect on inter and intra-provincial migration of TV exposure are negative and highly significant (column 1-3). In particular, exposure to one additional private channel decreases the chances of migrating during the next few years by 0.8-1.2 percentage point. When the dependent variable is migration across provinces (column 7-9), the estimated effect is still negative and highly significant: exposure to one additional private TV channel reduces the propensity to migrate by 0.6-0.7 percentage points. These results are fully consistent with the long run analysis.

IV estimates are reported in columns 4-6 (inter and intra-provincial migration) and 10-12 (inter-provincial migration) of table 9.[30] In our preferred specification (column 6), an additional private TV channel decreases (inter and intra-provincial) migration by 1.4 percentage points. For inter-provincial migration the gap between OLS and IV estimates is also small, but the latter coefficients are not significant. Given that the standard errors of the IV estimates are (at least) twice as large as those of the OLS ones, the loss in significance is not surprising. As in the case of the results for the long run analysis, we do not find evidence of endogeneity for current TV exposure.

How large are these estimated effects? In the *early exposure* analysis the variable measuring exposure to private TV channels has a mean equal to 1.24 with a standard deviation of 1.85 (table 1). According to the point estimates in table 7, one standard deviation increase in TV exposure reduces inter-provincial migration by 1.7-2.7 percentage points, and all migration movements by 3.9-6.8 percentage points. This increase in TV exposure implies a reduction in the inter-provincial migration rate of about 5-9 percent of its standard deviation, and a

[29]The district controls are now measured in 2000 using IFLS3 data. See footnote 23 for the full list.

[30]The first stage estimates are shown in table 8 (columns 4-6). As before, the instrument appears highly significant and one can clearly reject the null of weak instruments (the F-statistic varies between 21 and 40).

reduction in the overall migration rate of about 8-15 percent of its standard deviation.[31] Short run effects are similar in magnitude. In the *current exposure* analysis, a one standard deviation increase in TV exposure causes a reduction in inter-provincial migration of 4-8 percent of its standard deviation, and in overall migration of 12-14 percent of its standard deviation.

Our results are robust to a number of additional tests discussed in appendix A 2. In particular, we look at international and return migrants; we perform a placebo test exploiting the information on availability of electricity in different sub-districts; we deal with the potentially confounding effect of "Transmigration plans"; we remove the age restriction in our sample and we look at heterogenous effects of TV exposure.

7 Discussion and further results

According to the theoretical framework presented in section 3, information makes individuals better able to accurately predict the benefits and costs associated with geographical movements. In this context, the relationship between information and migration is ambiguous: if individuals were over rather than under-estimating the net gains from migration, more information should lead to less rather than more willingness to migrate. The empirical evidence in the previous section uncovers a causal negative relationship between TV exposure and migration, suggesting that individuals were on average over-estimating the benefits (and/or under-estimating the costs) of moving somewhere else within the country.

We can further explore this possibility by looking at the responses to a subjective economic ladder question contained in the IFLS .[32] If individuals think they are relatively poorer than they actually are, they may be more willing to migrate somewhere else to improve their condition (Stark and Taylor, 1991). In this context, more TV exposure may allow individuals to better

[31] See table 4 for descriptive statistics on migration rates.

[32] The question is: *"Please imagine a six-step ladder where on the bottom (the first step), stand the poorest people, and on the highest step (the sixth step), stand the richest people. On which step are you today?"*. This question has been employed before in other studies of subjective economic status in Indonesia (see Powdthavee 2007 and 2009).

assess their position in society and reduce their migration incentives. To test this conjecture, we use the the empirical model of equation (8), replacing the dependent variable by an indicator that takes value one if the individual reports being in the first or second step of the income ladder (i.e., among the poorest), and 0 otherwise. In our sample, roughly 30 percent of the respondents place themselves in the bottom part of the income distribution. The empirical model includes all the controls employed so far.

Table 10 reports the results based on the *early exposure* sample.[33] Both OLS and IV estimates of the TV exposure variable are negative and strongly significant. Accordingly, individuals more exposed to private TV at a young age are less likely to see themselves at the bottom end of the income distribution. More precisely, one additional private TV channel reduces the probability of reporting to be among the poorest group by 2 to 3.5 percentage points (a 6-11 percent reduction with respect to the mean). This holds even when we compare individuals with the same level of monthly consumption (columns 2 and 5) or labor income (columns 3 and 6). People with higher consumption/income are significantly less likely to place themselves among the poorest group, but lower TV exposure still increases this likelihood. Conditional on these latter variables, the effect of TV exposure on subjective positioning in the income distribution seems to reflect a difference in perception rather than in actual economic status.

Why are Indonesian citizens with less access to private TV networks systematically less informed about their relative position on the income distribution? Indeed, before the TV liberalization process, Indonesian citizens only had access to the public TV channel where the government placed severe restrict on news production and discussion of sensitive matters which could undermine the image of national prosperity and cohesion. In order to maintain popular support, all regimes have a strong interest in managing more favorable impressions of the country than the actual reality. This was clearly the case under Suharto's rule (see section 2.1). The expansion of private TV channels provided Indonesian citizens with better information; and true reporting on their country may have been crucial in shaping their internal migration

[33]Results from the *current exposure* sample are qualitatively very similar.

decisions.

As anticipated in the introduction, an alternative interpretation of our results is that broader access to television directly increases individual's utility and reduces their incentives to migrate. In developed countries, the existing evidence shows a negative correlation between the number of hours spent watching TV and measures of life satisfaction (Frey et al., 2007). In developing countries, however, the introduction of TV may make life more pleasant.[34] That being said, the introduction of TV in Indonesia had a negative effect on social participation and trust (Olken 2009). This may have negatively affected individual wellbeing (Helliwell 2006). The IFLS data allow us to directly test whether respondents who have been exposed to more TV report higher levels of life satisfaction. Using a question on subjective assessment of the current situation, we construct an indicator which is equal to 1 if the respondent is unhappy or very unhappy, and 0 otherwise. We use this indicator as dependent variable in estimating equation (8), and include all the usual controls. OLS and IV results for both the *"early exposure"* and the *"current exposure"* analysis are reported in table 11. While individuals with higher income or consumption are significantly less likely to be unhappy with their current situation, the estimated coefficients on TV exposure oscillate around zero and are never statistically significant at conventional levels.[35]

These results are evidence that exposure to TV does not seem to directly increase individual utility. Therefore, one can hardly expect it to affect migration incentives by lowering incentives to migrate. Moreover, the amenity interpretation can not account for the differences in perceived poverty that have been documented above. In our view, these findings points at the increase in information - rather than the increase in utility - as the main driver of the reduction in migration rates that we observe in the data.

[34]Indeed, in the only study on developing countries we are aware of, Kataria and Tobias (2011) find that being a TV viewer is positively correlated with life satisfaction, while hours of TV watching are not correlated with it.

[35]In unreported regressions, we find similar evidence looking at alternative questions on assessment of current family life and current family standards.

8 Conclusions

Although the empirical evidence is still scarce, there is a widespread perception that access to Western media, movies and TV series may increase the willingness to migrate abroad of citizens in developing countries. Exposure to foreign media may foster individuals' economic aspirations, modify reference groups and create false expectations about life in other countries.[36] However, it is less clear what one should expect about the relationship between increased access to media and internal migration.

In this paper, we argue that having more media coverage of one's own country does not necessarily increase the incentives to internally migrate. More information leads to more accurate migration choices. Hence, the final effect on migration depends on whether individuals, in the absence of information, tend to under- rather than over-estimate the potential gains from migrating. We uncover a strong negative effect of TV exposure on the propensity to internally migrate. It appears that Indonesian citizens prior to the expansion of private TV broadcasting were too optimistic in assessing the potential gains from moving. Indeed, we find that individuals less exposed to TV are more likely to perceive themselves as poor, while TV has no significant impact on life satisfaction. All these findings are consistent with a shift from a regime-controlled TV system to pluralistic one, a system far better able (and willing) to truthfully portray actual living conditions in different areas of the country.

The main policy implication of our findings is that increasing access to information in developing countries not only may help citizens in making better migration choices, but it can also reduce migratory pressures. This particularly relevant for countries such as China, where the government is extremely concerned about the size of internal migration. In this case, providing more information could potentially be an alternative to the restrictive measures on geographical movements.

[36] *"The most obvious transformation of our life was the arrival of television, which shows us with total intimacy how other people live. Where people once compared themselves with the people round the corner, they can now compare themselves with anyone they like, up to J.R. in Dallas. It would be astonishing if such comparisons were not unsettling."* (Layard, 2003; p.15).

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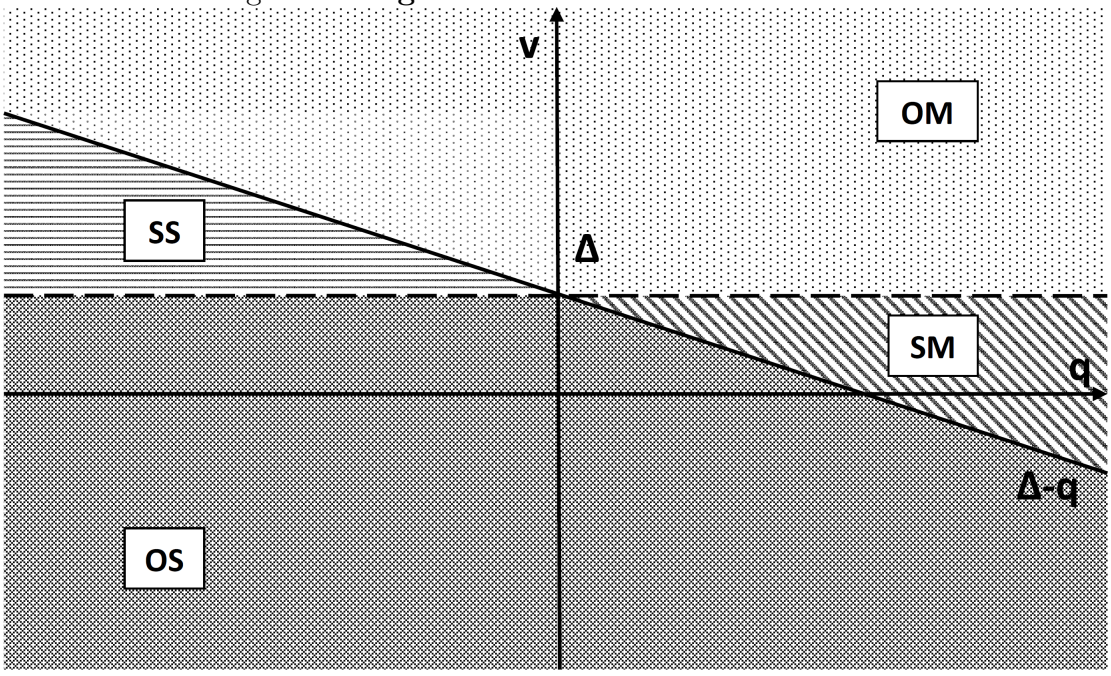
Figures

Figure 1: **Migration choices and information**



Notes. OM: Optimal Migrants; SM: Sub-Optimal Migrants; SS: Sub-Optimal Stayers; OS: Optimal Stayers.

Tables

Table 1: **Descriptive statistics: TV reception, by TV network**

TV network	Year of establishment/ first on air	*Early exposure*				*Current exposure*			
		Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Public network:									
TVRI	**1962**	0.44	*0.26*	0	0.95	0.88	0.16	0.09	1
Major private networks									
Indosiar	**1995**	0.14	*0.24*	0	0.88	0.76	0.35	0	1
RCTI	**1987**	0.25	*0.29*	0	0.93	0.78	0.34	0	1
SCTV	**1989**	0.22	*0.28*	0	0.92	0.77	0.34	0	1
Minor private networks									
Anteve	**1993**	0.14	*0.23*	0	0.89	0.63	0.37	0	1
Global TV	**2001**	0.03	*0.11*	0	0.75	0.40	0.37	0	1
Lativi	**2001**	0.04	*0.12*	0	0.75	0.44	0.41	0	1
Metro TV	**2000**	0.13	*0.22*	0	0.89	0.58	0.38	0	1
TPI	**1990**	0.19	*0.25*	0	0.91	0.67	0.35	0	1
Trans TV	**2001**	0.05	*0.14*	0	0.75	0.63	0.39	0	1
TV7 (Trans 7)	**2001**	0.04	*0.13*	0	0.75	0.53	0.41	0	1
TV	**-**	1.24	*1.85*	0	8.40	6.18	3.27	0	10
Observations			14648				8345		

Notes. *Early exposure* refers to the analysis of the long-run effect of TV exposure, while *current exposure* refers to the analysis of the short run one. The sample is restricted to individuals aged 16 to 45. Information on year of establishment (or first year on air) are taken from Hollander et al. (2009). Each variable measures the average fraction of villages in each district where there was a clear reception of the TV channel.

Table 2: **Descriptive statistics**

		Early exposure					
		All		**Migrants**		**Non migrants**	
		avg	**std dev**	**avg**	**std dev**	**avg**	**std dev**
male		0.48	*0.50*	0.47	*0.50*	0.48	*0.50*
age		29.01	*8.57*	30.85	*7.76*	28.21	*8.77*
education:	**primary**	0.34	*0.47*	0.30	*0.46*	0.36	*0.48*
	secondary	0.55	*0.50*	0.53	*0.50*	0.56	*0.50*
	college	0.10	*0.30*	0.16	*0.37*	0.07	*0.26*
residence at age 12: urban		0.14	*0.35*	0.12	*0.33*	0.15	*0.36*
Observations		14648		4436		10212	
		Current exposure					
		All		**Migrants**		**Non migrants**	
		avg	**std dev**	**avg**	**std dev**	**avg**	**std dev**
male		0.46	*0.50*	0.54	*0.50*	0.45	*0.50*
age		29.39	*8.48*	23.12	*7.05*	30.26	*8.30*
education:	**primary**	0.47	*0.50*	0.24	*0.43*	0.51	*0.50*
	secondary	0.46	*0.50*	0.63	*0.48*	0.43	*0.50*
	college	0.07	*0.26*	0.13	*0.33*	0.06	*0.25*
residence in 2000: urban		0.12	*0.32*	0.16	*0.37*	0.11	*0.31*
Observations		8345		1018		7327	

Notes. *Early exposure* refers to the analysis of the long-run effect of TV exposure, while *current exposure* refers to the analysis of the short run one. The sample is restricted to individuals aged 16 to 45. Migrants are those respondents who moved to another province or to another district within the same province.

Table 3: **Provinces of residence**

		Early exposure		*Current exposure*	
Province code	**Province name**	**Residence at age 12 (%)**	**Residence 2007/08 (%)**	**Residence 2000 (%)**	**Residence 2007/08 (%)**
12	**SUMATERA UTARA**	*5.46*	*4.88*	*4.10*	*3.98*
13	**SUMATERA BARAT**	*0.06*	*0.20*	-	*0.07*
14	**RIAU**	-	*0.55*	*0.35*	*0.38*
16	**SUMATERA SELATAN**	*6.08*	*6.04*	*5.39*	*5.28*
18	**LAMPUNG**	*4.87*	*4.98*	*4.70*	*4.70*
31	**DKI JAKARTA**	-	*3.15*	-	*0.81*
32	**JAWA BARAT**	*20.41*	*20.77*	*16.21*	*16.41*
33	**JAWA TENGAH**	*17.13*	*13.78*	*16.49*	*15.84*
34	**DI YOGYAKARTA**	*5.84*	*5.84*	*7.42*	*7.13*
35	**JAWA TIMUR**	*17.97*	*17.06*	*20.37*	*20.40*
51	**BALI**	*6.62*	*6.77*	*8.51*	*8.51*
52	**NUSA TENGGARA BARAT**	*9.46*	*9.29*	*10.05*	*9.98*
61	**KALIMANTAN BARAT**	-	*0.01*	-	-
62	**KALIMANTAN TENGAH**	-	*0.03*	-	-
63	**KALIMANTAN SELATAN**	-	*0.51*	-	*0.05*
64	**KALIMANTAN TIMUR**	-	*0.15*	-	*0.16*
73	**SULAWESI SELATAN**	*6.10*	*5.97*	*6.41*	*6.30*
	Total	*100*	*100*	*100*	*100*
	Observations	14648		8345	

Notes. *Early exposure* refers to the analysis of the long-run effect of TV exposure, while *current exposure* refers to the analysis of the short run one. The sample is restricted to individuals aged 16 to 45. Residence in 2007-2008 is recorded in IFLS4 and residence in 2000 in IFLS3.

Table 4: **Migration rates**

		Inter and intra-provincial migration		Inter-provincial migration		Obs.
		mean (%)	std dev	mean (%)	std dev	
Early exposure						
full sample		30.3	*46.0*	10.7	*30.9*	14648
by gender:	**female**	30.9	*46.2*	10.6	*30.9*	7674
	male	29.7	*45.7*	10.7	*30.9*	6974
by education:	**primary**	26.5	*44.2*	7.5	*26.4*	4837
	secondary	29.6	*45.6*	11.7	*32.1*	7807
	college or more	49.7	*50.0*	17.1	*37.7*	1408
Current exposure						
		Inter and intra-provincial migration		**Inter-provincial migration**		**Obs.**
		mean (%)	std dev	mean (%)	std dev	
full sample		12.2	*32.7*	5.5	*22.8*	8345
by gender:	**male**	14.4	*35.2*	6.9	*25.4*	3816
	female	10.3	*30.4*	4.2	*20.2*	4529
by education:	**primary**	6.6	*24.8*	2.5	*15.7*	3675
	secondary	17.9	*38.3*	8.7	*28.1*	3557
	college or more	22.4	*41.8*	9.5	*29.4*	566

Notes. *Early exposure* refers to the analysis of the long-run effect of TV exposure, while *current exposure* refers to the analysis of the short run one. The sample is restricted to individuals aged 16 to 45. Inter and intra-provincial migration refers to movements across provinces and across districts within the same province; inter-provincial migration refers only to movements across provinces.

Table 5: **Type of internal migration movements**

Migration movement type	***Early exposure*** (%)	***Current exposure*** (%)
rural → rural	*42.10*	*51.43*
rural → urban	*38.56*	*30.37*
urban → rural	*12.27*	*6.80*
urban → urban	*7.07*	*11.40*
Total	*100*	*100*
# migratory movements	6364	912

Notes. *Early exposure* refers to the analysis of the long-run effect of TV exposure, while *current exposure* refers to the analysis of the short run one. The sample is restricted to individuals aged 16 to 45. Each migratory movement observed in the data is classified in one of the four categories (rural-rural; rural-urban; urban-rural; urban-urban) depending on whether the districts of origin and that of destination are urban or rural.

Table 6: **TV reception and district characteristics**

Distance from province capital - hours	0.035
	[0.189]
Distance from province capital - Km	-0.016***
	[0.005]
Altitude	-0.000
	[0.000]
Urban area	-0.350
	[0.758]
Number of schools	0.022
	[0.051]
Ln (total population)	-0.586
	[0.398]
HHs living in slums (%)	0.015
	[0.026]
HHs with a member college-educated (%)	-0.010
	[0.022]
Poor HHs (%)	0.011
	[0.011]
Primary activity: agriculture (%)	-0.486
	[0.778]
Primary activity: industry (%)	0.753
	[1.155]
Primary activity: trade (%)	0.714
	[0.870]
Ln (monthly HH consumption)	1.108
	[0.804]
Years since electricity introduction	0.004
	[0.023]
Province fixed effects	X
Observations	107
R-squared	0.787

Notes. The table reports OLS estimates of district TV reception on district level controls. The dependent variable is the average number of private TV channels received in the villages within each district (measured by 2006 PODES). District level controls are measured using the IFLS3 survey (2000). Robust standard errors in square brackets: * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 7: **Internal migration and TV exposure: *early exposure***

	Inter and intra-provincial migration						Inter provincial migration					
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	OLS	**OLS**	**OLS**	**IV**	**IV**	**IV**	**OLS**	**OLS**	**OLS**	**IV**	**IV**	**IV**
TV	-0.022**	-0.023**	-0.021**	-0.038**	-0.040***	-0.037**	-0.011***	-0.011***	-0.009***	-0.014***	-0.015***	-0.015***
	[0.010]	[0.010]	[0.009]	[0.015]	[0.015]	[0.015]	[0.003]	[0.003]	[0.003]	[0.005]	[0.005]	[0.005]
Individual controls	X	X	X	X	X	X	X	X	X	X	X	X
Education dummies		X	X		X	X		X	X		X	X
District controls			X			X			X			X
Province dummies	X	X	X	X	X	X	X	X	X	X	X	X
Observations	14,648	14,228	12,761	14,648	14,228	12,761	14,648	14,228	12,761	14,648	14,228	12,761
R-squared	0.102	0.131	0.154	0.102	0.130	0.153	0.059	0.070	0.060	0.059	0.069	0.060
IV: F-statistic				272.1	269.3	221.0				272.1	269.3	221.0
IV: Endogeneity test				0.030	0.033*	0.032				0.007	0.008	0.012
				[0.019]	[0.019]	[0.019]				[0.007]	[0.007]	[0.007]

Notes. *Early exposure* refers to the analysis of the long-run effect of TV exposure. The sample is restricted to individuals aged 16 to 45. OLS and IV estimates of inter and intra-provincial migration are reported. Migrants are those respondents who moved to another province or to another district within the same province with respect to their residence at age 12. Inter and intra-provincial migration includes movements across provinces and across districts within the same province; inter-provincial migration includes only movements across provinces. In IV regressions the number of private TV channels received in each district (TV) is treated as endogenous and the instrument is the "predicted signal strength" variable ($TV - PSS$). The first stage results are reported in table 8, columns (1-3). Other controls: a) individual controls: male dummy, year of birth dummies; b) education dummies: primary, secondary, college and other education; c) district controls (district of residence at age 12): $TV - FSS$ ("free-space signal strength"); distance from the province capital (in km); degree of urbanization; number of schools; altitude; share of coastal villages; share of villages where primary activity is agriculture, industry or trade; number of households; share of houses with cement walls; log of monthly household consumption; years since electricity was introduced; d) province dummies: province of residence at age 12. Robust standard errors in square brackets are clustered by district (141 districts in the sample): * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 8: **First stage regressions**

	Early exposure			*Current exposure*		
	1	**2**	**3**	**4**	**5**	**6**
	OLS	**OLS**	**OLS**	**OLS**	**OLS**	**OLS**
TV-PSS	0.041***	0.041***	0.041***	0.056***	0.056***	0.048***
	[0.002]	[0.003]	[0.003]	[0.009]	[0.009]	[0.010]
TV-FSS	X	X	X	X	X	X
Individual controls	X	X	X	X	X	X
Education		X	X		X	X
District controls			X			X
Province dummies	X	X	X	X	X	X
Observations	14,648	14,228	12,761	8,345	7,798	6,105
R-squared	0.882	0.881	0.894	0.846	0.843	0.894
Fstat:	272.1	269.3	221.0	39.84	39.88	21.24
Fstat pvalue:	0.00	0.00	0.00	0.00	0.00	0.00

Notes. *Early exposure* refers to the analysis of the long-run effect of TV exposure, while *current exposure* refers to the analysis of the short run one. The sample is restricted to individuals aged 16 to 45. The table reports first stage estimates of the IV estimation in table 7 and 9. The dependent variable is the number of private TV channels received in each district (TV). The "predicted signal strength" variable *(TV-PSS)* is the instrument. Controls in columns 1-3 are as in table 7, and in columns 4-6 as in table 9. Robust standard errors in square brackets are clustered by district (141 districts in the *early exposure* sample; 135 districts in the *current exposure* sample): * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 9: **Internal migration and TV exposure: *current exposure***

	Inter and intra-provincial migration						Inter provincial migration					
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	OLS	**OLS**	**OLS**	**IV**	**IV**	**IV**	**OLS**	**OLS**	**OLS**	**IV**	**IV**	**IV**
TV	-0.008***	-0.010***	-0.012***	-0.013**	-0.015**	-0.014*	-0.007***	-0.007***	-0.006***	-0.005	-0.005	-0.003
	[0.003]	[0.003]	[0.004]	[0.007]	[0.006]	[0.008]	[0.002]	[0.002]	[0.002]	[0.004]	[0.004]	[0.004]
Individual controls	X	X	X	X	X	X	X	X	X	X	X	X
Education dummies		X	X		X	X		X	X		X	X
District controls			X			X			X			X
Province dummies	X	X	X	X	X	X	X	X	X	X	X	X
Observations	8,345	7,798	6,105	8,345	7,798	6,105	8,345	7,798	6,105	8,345	7,798	6,105
R-squared	0.163	0.167	0.162	0.163	0.167	0.162	0.096	0.099	0.099	0.096	0.099	0.099
IV: F-statistic				39.84	39.88	21.24				39.84	39.88	21.24
IV: Endogeneity test				0.006	0.006	0.003				-0.002	-0.002	-0.004
				0.008	0.008	0.009				[0.005]	[0.005]	[0.006]

Notes. *Current exposure* refers to the analysis of the short run effect of TV exposure. The sample is restricted to individuals aged 16 to 45. OLS and IV estimates of inter and intra-provincial migration are reported. Migrants are those respondents who moved to another province or to another district within the same province between 2000 and 2007-2008 (and stayed in the new residence more than 6 months). Inter and intra-provincial migration includes movements across provinces and across districts within the same province; inter-provincial migration includes only movements across provinces. In IV regressions, the number of private TV channels received in each district (TV) is treated as endogenous and instrumented using the "predicted signal strength" variable ($TV - PSS$). The first stage results are reported in table 8, columns (4-6). Other controls: a) individual controls: male dummy, year of birth dummies and marital status; b) education dummies: primary, secondary, college and other education; c) district controls: $TV - FSS$ ("free-space signal strength"); average distance in km from the province capital; average time of traveling from the province capital; average elevation with respect to the sea level; number of schools; log of total population; share of households living in slums; share of households with at least one member that has attended university; share of poor households; share of villages within the district where main activity is agriculture, industry or trade; log of monthly average household consumption (thousand of rupiahs); years since electricity was introduced; d) province dummies: province of residence in 2000. Robust standard errors in square brackets are clustered by district (135 districts): * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 10: **Self-reported poverty and TV exposure: *early exposure***

	1 OLS	2 OLS	3 OLS	4 IV	5 IV	6 IV
TV	-0.022***	-0.022***	-0.024***	-0.035***	-0.036***	-0.039***
	[0.007]	[0.007]	[0.007]	[0.010]	[0.010]	[0.009]
ln(labor income)		-0.008***			-0.008***	
		[0.001]			[0.001]	
ln(consumption)			-0.061***			-0.061***
			[0.006]			[0.006]
Other controls	X	X	X	X	X	X
Observations	12,766	12,074	12,082	12,766	12,074	12,082
R-squared	0.094	0.100	0.108	0.093	0.099	0.107
IV: F-statistic				221.3	226.6	225.4
IV: F-statistic p-value				0.00	0.00	0.00

Notes. *Early exposure* refers to the analysis of the long-run effect of TV exposure. The sample is restricted to individuals aged 16 to 45. The table reports OLS and IV estimates of self-reported position in the income distribution. The dependent variable is an indicator that takes value 1 if the respondent reports being in the first or the second step of the income distribution ladder (i.e., among the poorest) and 0 otherwise. In IV regressions, the number of private TV channels received in each district (TV) is treated as endogenous and instrumented using the "predicted signal strength" variable ($TV - PSS$). Controls: ln(consumption) is the log of individual consumption: the variable is obtained by applying the OECD equivalence scale to total household consumption; ln (labor income) is the log of individual labor income: the variable is obtained by applying the OECD equivalence scale to total household labor income. Other controls: a) individual controls: male dummy, year of birth dummies; b) education dummies: primary, secondary, college and other education; c) district controls (district of residence at age 12): $TV - FSS$ ("free-space signal strength"); distance from the province capital (in km); degree of urbanization; number of schools; altitude; share of coastal villages; share of villages where primary activity is agriculture, industry or trade; number of households; share of houses with cement walls; log of monthly per capita consumption; years since electricity was introduced; d) province dummies: province of residence at age 12. Robust standard errors in square brackets are clustered by district (141 districts): * significant at 10%, ** significant at 5%, *** significant at 1%.

Table 11: **Life satisfaction and TV exposure**

	Early exposure						*Current exposure*					
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	OLS	**OLS**	**OLS**	**IV**	**IV**	**IV**	**OLS**	**OLS**	**OLS**	**IV**	**IV**	**IV**
TV	-0.001	-0.001	-0.001	-0.001	0.000	-0.001	-0.001	-0.001	-0.002	0.012	0.013	0.011
	[0.003]	[0.003]	[0.003]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.011]	[0.011]	[0.012]
ln(HH labor income)		-0.003***			-0.003***			-0.001			-0.001	
		[0.001]			[0.001]			[0.001]			[0.001]	
ln(HH consumption)			-0.014***			-0.014***			-0.012**			-0.012**
			[0.003]			[0.003]			[0.005]			[0.005]
Other controls	X	X	X	X	X	X	X	X	X	X	X	X
Observations	12,782	12,089	12,097	12,782	12,089	12,097	6,123	6,118	6,084	6,123	6,118	6,084
R-squared	0.018	0.020	0.020	0.018	0.020	0.020	0.034	0.034	0.035	0.031	0.031	0.032
IV: F-statistic				220.8	226.0	224.8				20.77	20.92	20.78
IV: F-statistic p-value				0.00	0.00	0.00				0.00	0.00	0.00

Notes. *Early exposure* refers to the analysis of the long-run effect of TV exposure, while *current exposure* refers to the analysis of the short run one. The sample is restricted to individuals aged 16 to 45. The table reports OLS and IV estimates of self-reported satisfaction with current situation. The dependent variable is an indicator that takes value 1 if the respondent reports being unhappy or "very unhappy" with the current situation. In IV regressions, the number of private TV channels received in each district ($\overline{TV}$) is treated as endogenous and the instrument is the "predicted signal strength" variable ($TV - PSS$). Controls: ln(consumption) is the log of individual consumption: the variable is obtained by applying the OECD equivalence scale to total household consumption; ln (labor income) is the log of individual labor income: the variable is obtained by applying the OECD equivalence scale to total household labor income. The additional controls included are those in Tables 7 for the *early exposure* analysis, and in Table 9 for the *current exposure* one. Robust standard errors in square brackets are clustered by district (141 districts in the *early exposure* analysis; 135 districts in the *current exposure* one): * significant at 10%, ** significant at 5%, *** significant at 1%.

On-line appendix

A 1 Theoretical model

A 1.1 Optimal and sub-optimal migration decisions: classifying individuals into four groups

We can classify individuals into four different groups: Optimal Migrants (OM), Sub-Optimal Migrants (SM), Optimal Stayers (OS) and Sub-Optimal Stayers (SS). The shares of individuals in each group are given by the following probabilities:

$$Pr(OM=1) = Pr(I_q=1; I=1) = Pr(v+q \geq \Delta; v \geq \Delta) = \begin{cases} Pr(v \geq \Delta) & \text{if} \quad q>0 \\ Pr(v \geq \Delta - q) & \text{if} \quad q<0 \end{cases} \tag{A 1}$$

$$Pr(SM=1) = Pr(I_q=1; I=0) = Pr(v+q \geq \Delta; v < \Delta) = \begin{cases} Pr(\Delta - q \leq v < \Delta) & \text{if} \quad q>0 \\ 0 & \text{if} \quad q<0 \end{cases} \tag{A 2}$$

$$Pr(OS=1) = Pr(I_q=0; I=0) = Pr(v+q < \Delta; v < \Delta) = \begin{cases} Pr(v < \Delta - q) & \text{if} \quad q>0 \\ Pr(v < \Delta) & \text{if} \quad q<0 \end{cases} \tag{A 3}$$

$$Pr(SS=1) = Pr(I_q=0; I=1) = Pr(v+q < \Delta; v \geq \Delta) = \begin{cases} 0 & \text{if} \quad q>0 \\ Pr(\Delta \leq v < \Delta - q) & \text{if} \quad q<0 \end{cases} \tag{A 4}$$

A 1.2 Information and probability of making optimal and sub-optimal migration decisions

We can now study how migration decisions respond to an increased availability of information. It is straightforward to show that:

$$\frac{\partial Pr(OM=1)}{\partial i} \begin{cases} =0 & \text{if} \quad \overline{q}>0 \\ >0 & \text{if} \quad \overline{q}<0 \end{cases} \tag{A 5}$$

$$\frac{\partial Pr(SM=1)}{\partial i} \begin{cases} <0 & \text{if} \quad \overline{q}>0 \\ =0 & \text{if} \quad \overline{q}<0 \end{cases} \tag{A 6}$$

$$\frac{\partial Pr(OS=1)}{\partial i} \begin{cases} >0 & \text{if} \quad \overline{q}>0 \\ =0 & \text{if} \quad \overline{q}<0 \end{cases} \tag{A 7}$$

$$\frac{\partial Pr(SS=1)}{\partial i} \begin{cases} =0 & \text{if} \quad \overline{q}>0 \\ <0 & \text{if} \quad \overline{q}<0 \end{cases} \tag{A 8}$$

A 2 Robustness checks

After establishing our main result - exposure to private TV causally reduces the propensity to internally migrate of Indonesian citizens - we perform a number of additional tests to assess the robustness of our estimates.

International migrants. The negative effect of TV on internal migration could be, at least partially, driven by an increasing tendency to migrate internationally. If access to private TV networks increased the propensity to migrate abroad and if the individuals moving abroad had, otherwise, migrated within Indonesia, one would observe a drop in internal migration following an expansion in TV exposure. The IFLS survey allows us to identify international migrants as it collects information on the new residence of individuals who were interviewed in any of the four waves and then moved abroad.[37] We identify 374 international migrants to conduct the *early exposure* analysis (2.9 percent of the sample), and 179 for the *current exposure* one (2.8 percent of the sample). We estimate equation (8) using as dependent variable an indicator that identifies international migrants from individuals who remained in Indonesia (no matter whether they internally moved or not). The results are reported in Table A 1. There is no evidence of any significant impact of early exposure (column 1 and 2). As for the short run, the OLS estimate (column 3) suggests a small and negative effect of TV exposure on international migration. The magnitude of this coefficient is about one third of that estimated for overall internal migration. Note, however, that when the private TV exposure variable is instrumented, the coefficient becomes positive and not significantly different from zero. Therefore, we can conclude that TV exposure had a negative small effect (if any) on international migration and that the negative effect on internal migration cannot be simply explained by an increase in the propensity to move abroad.

Return migrants. Having access to more information should allow individuals to make better migration choices. If a fraction of the return migrants are individuals who over-estimated the gains from migration and who, once they found out their mistake, returned to their original residence (Borjas and Bartsberg, 1996), we may observe less return migration among the individuals who had more access to TV (i.e., were more informed). On the other hand, being able to better choose both the destination and the timing for migration, should speed up the economic assimilation of migrants. That is, if they have some sort of target-saving behavior, better informed migrants may manage to meet their target quicker and return back home earlier.[38] Therefore, the predictions about the effect

[37] Respondents who moved abroad are not tracked down and, therefore, they leave the sample. However, some information is still collected by interviewing other household members. Although there are inherent data problems in performing this kind of empirical analysis (i.e., high attrition rates and potentially inaccurate information reported by family members), we think it is still worth looking at this evidence.

[38] Target-saving behavior could be created by preferences for consumption and/or higher purchasing power in the home country (Dustmann, 2001; Dustmann and Weiss, 2007)

of information on return migration are theoretically ambiguous. We test this on our data using the *early exposure* sample, which covers a larger span of time and allows more individuals to return. In this sample, about 10 percent of the inter-provincial migrants returned to their province of initial residence, and 6 percent of the internal migrants returned to the district of origin. We restrict the sample only to internal migrants and estimate equation (8) using as a dependent variable an indicator that identifies return migrants. In unreported regressions, we do not find any significant relationship between being a return migrant and TV exposure.

Electricity. Since there is no available information on the geographical evolution of TV reception over time, we have made some assumptions to predict it and carry out our *"early exposure"* analysis (see section 4.2). To test the validity of this approach we conduct a placebo test using the information on the year electricity was first introduced in each subdistrict of the IFLS. We are able to recover this information for about 75 percent of our sample. In areas without electricity, TV signal should not be relevant for individual migration decisions. Since by 2000 all the individuals in the sample lived in areas with electricity, we restrict the analysis to the *early exposure*. We split the sample in two groups according to whether the individual at age 12 lived in a subdistrict with or without electricity access. Then, we separately estimate equation (8) for these two groups. Given that the information on electricity availability is collected at the sub-district level, while TV exposure is measured at the district level, we can exploit variation in availability of electricity within district. The results reported in table A 2 support our conjecture: TV reception at an early age significantly reduces migration of individuals who had electricity (columns 3-4) while it has no significant effect on those who did not (columns 5-6).

Transmigration plans. A reason of concern regarding our results may be the existence (and the conclusion) of the "Transmigration plans" (see section 2.2). Given that these programs basically ended in the late 1990s, our *current exposure* analysis is not affected, while the *early exposure* one may be biased by the presence of "transmigrants" in our sample. All IFLS respondents who reported to have migrated were asked about the reason of the move, and identifying themselves as "transmigrants" was one of the options. In our main estimating sample, the share of migrants who were "transmigrants" is very small: 1.2 percent of inter and intra-provincial migrants and 1.7 percent of inter-provincial migrants. If "transmigrants" were driving (or biasing) our results, we should observe a change in our estimated coefficients when we remove them from the sample. Reassuringly, our results are not affected when we do that. Not only there is a negligible share of transmigrants in our sample, but being a "transmigrant" and TV reception at age 12 have almost zero correlation in our data (which is what would cause a bias in our estimates). As a further robustness check, we have removed from the sample all provinces which have been source of transmigration outflows (Java, Bali and Lombok). This leaves us with about 20 percent of our sample. In spite of the drastic reduction in the number of observations (which clearly affects the significance levels of our estimates), our results are still confirmed. Finally, given that younger cohorts are less likely to have been affected by these programs, we have restricted our estimating sample only to people aged 25 or less in 2007-08 (using all the provinces, they account

for almost 40 percent of our main sample). Again, our results are robust to this restriction of the estimating sample.[39]

Full sample and heterogenous effects. To conclude, we explore the implications of our age restriction (i.e., individuals aged 16 to 45) by conducting the analysis on all the individuals older than 15. The results are reported in table A 3. The number of observations increases to 18.6 thousand in the *early exposure* sample, (columns 1-6), and to 9.7 thousand in the *current exposure* one, (columns 7-12). A comparison with the tables 7 and 9 shows that including older people in the analysis does not alter our results. In unreported regressions, we have also examined whether the impact of TV exposure on migration choices vary by gender, age or level of education. We do not find any clear-cut evidence of heterogeneous effects.

[39] All estimation results mentioned in this paragraph can be provided upon request.

A 3 Tables

Table A 1: **Robustness checks: International Migrants**

	Early exposure		***Current exposure***	
	1	**2**	**3**	**4**
	OLS	**IV**	**OLS**	**IV**
TV	0.002	0.001	-0.004**	0.007
	[0.002]	[0.003]	[0.002]	[0.006]
Other controls	X	X	X	X
Observations	13,135	13,135	6,294	6,294
R-squared	0.027	0.027	0.041	0.035
IV: F-statistic		233.4		21.19
IV: F-statistic pvalue		0.00		0.00
Share of international migrants	2.9%		2.8%	

Notes. *Early exposure* refers to the analysis of the long-run effect of TV exposure, while *current exposure* refers to the analysis of the short run one. The sample is restricted to individuals aged 16 to 45. The dependent variable is an indicator for international migrants. In IV regressions, the number of private TV channels received in each district (TV) is treated as endogenous and the instrument is the "predicted signal strength" variable ($TV - PSS$). The additional controls included are those in Table 7 for *early exposure* and in table 7 for *current exposure*. Robust standard errors in square brackets are clustered by district (141 districts in the *early exposure* sample; 135 districts in the *current exposure* sample): * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A 2: **Robustness checks: electricity - *Early exposure***

	All		**Electricity YES**		**Electricity NO**	
	1	**2**	**3**	**4**	**5**	**6**
	OLS	**IV**	**OLS**	**IV**	**OLS**	**IV**
TV	-0.016*	-0.026*	-0.018*	-0.031*	-0.013	-0.002
	[0.009]	[0.015]	[0.009]	[0.016]	[0.023]	[0.038]
Other controls	X	X	X	X	X	X
Observations	9,763	9,763	7,482	7,482	2,281	2,281
R-squared	0.197	0.197	0.198	0.197	0.271	0.271
IV: F-statistic		210.0		171.4		69.02
IV: F-statistic p-value		0.00		0.00		0.00

Notes. *Early exposure* refers to the analysis of the long-run effect of TV exposure. The sample is restricted to individuals aged 16 to 45 for whom the information on the year of introduction of electricity in their sub-district of residence at age 12 is available. In columns 1 and 2, the full sample is used (*"All"*); in columns 3 and 4, the sample is restricted to individuals that, at age 12, lived in a subdistrict with electricity (*"Electricity YES"*); in columns 5 and 6, the sample is restricted to individuals that, at age 12, lived in a subdistrict without electricity (*"Electricity NO"*). OLS and IV estimates of inter and intra-provincial migration are reported. In IV regressions, the number of private TV channels received in each district (TV) is treated as endogenous and instrumented using the "predicted signal strength" variable ($TV - PSS$). Controls are as in table 7. Robust standard errors in square brackets are clustered by district (141 districts): * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A 3: **Robustness checks: Full Sample**

	Early exposure						*Current exposure*					
	Inter and intra-provincial migration			**Inter provincial migration**			**Inter and intra-provincial migration**			**Inter provincial migration**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	OLS	**OLS**	**IV**	**OLS**	**OLS**	**IV**	**OLS**	**OLS**	**IV**	**OLS**	**OLS**	**IV**
TV - private	-0.026**	-0.025**	-0.043**	-0.012***	-0.010***	-0.016***	-0.008***	-0.011***	-0.013*	-0.006***	-0.005***	-0.002
	[0.010]	[0.010]	[0.017]	[0.003]	[0.003]	[0.005]	[0.003]	[0.003]	[0.007]	[0.002]	[0.002]	[0.004]
District controls		X	X		X	X		X	X		X	X
Other controls	X	X	X	X	X	X	X	X	X	X	X	X
Observations	18,598	16,563	16,563	18,598	16,563	16,563	9,712	7,682	7,682	9,712	7,682	7,682
R-squared	0.147	0.168	0.167	0.068	0.059	0.059	0.171	0.165	0.165	0.102	0.099	0.099
IV: F-statistic			224.0			224.0			18.09			18.09
IV: Endogeneity test			0.036			0.012			0.003			-0.004
			[0.022]			[0.008]			[0.007]			[0.004]

Notes. *Early exposure* refers to the analysis of the long-run effect of TV exposure, while *current exposure* refers to the analysis of the short run one. The sample includes individuals aged 16 or more. OLS and IV estimates of inter and intra-provincial migration are reported. The dependent variable is an indicator for internal migrants (the definition of internal migrant for the *early exposure* and *current exposure* are, respectively, as in Table 7 and 9). In IV regressions, the number of private TV channels received in each district (TV) is treated as endogenous and the instrument is the "predicted signal strength" variable ($TV - PSS$). The additional controls included are those in Tables 7 for the *early exposure* analysis, and in Table 9 for the *current exposure* one. Robust standard errors in square brackets are clustered by district (141 districts in the *early exposure* sample; 135 districts in the *current exposure* sample): * significant at 10%, ** significant at 5%, *** significant at 1%.